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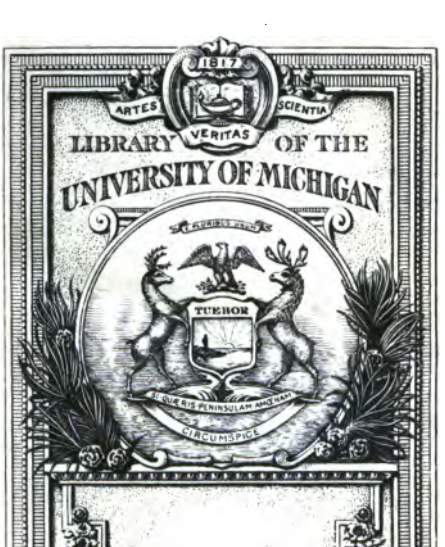
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THE

TUTOR's ASSISTAN MODERNISED;

OR, A

REGULAR SYSTEM

OF

PRACTICAL ARITHMETIC

Comprising all the MODERN IMPROVEMENTS in that ART, that are neceſſary for the MAN of BUSINESS and the PRACTICAL SCHOLAR.

By the Rev. THOMAS PEACOCK.

NEWCASTLE UPON TYNE:

Printed by HALL and ELLIOT.

MDCCXCI.

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Seabell
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An EXPLANATION of the CHARACTERS made Use of in this BOOK.

Signs.	*Names.*	*Significations.*
+	Plus, or more.	The sign of Addition; as, 4+2=6, or 4 added to 2 is equal to 6.
—	Minus, or less.	The sign of Subtraction; as, 6—2=4, or 6 less by 2 is equal to 4.
×	Multiplied by.	The sign of Multiplication; as, 8×3=24, or 8 multiplied by 3 is equal to 24.
÷	Divided by.	The sign of Division; as, 24÷3=8, or 24 divided by 3 is equal to 8.
=	Equal to.	The sign of Equality; as, 4+5=9, or 4 added to 5 is equal to 9.
: :: :	Proportion.	The signs of Proportion; as, 2 : 4 :: 6 : to 12, or as 2 is to 4, so is 6 to 12.

PREFACE.

MY primary intention for compoſing the following ſheets, was, that I might have a book of Arithmetic, compriſing a ſyſtem of rules and examples adapted to the capacity of young ſcholars, containing the moſt uſeful improvements in that art, and fitted for the ſchoolmaſter and man of buſineſs. When it was finiſhed, and ready for the preſs, I thought it might be uſeful to others, as well as myſelf, who are engaged in the arduous taſk of educating youth. This induced me to give it to the public. How far my ſyſtem may merit the countenance of my brother ſchoolmaſters, and the approbation of the public, time only can determine. I aſpire not after fame. Placed in an obſcure corner, my higheſt ambition is to diſcharge the manifold duties of my profeſſion with integrity, and to do all the ſervice I poſſibly can to my flock, my pupils, and my own family.

I have ſtudied to expreſs the rules with perſpicuity and conciſeneſs, and to illuſtrate each particular rule with examples adapted to the capacities both of the young tyro, and the more adult ſcholar. Such obſervations as were not ſo immediately neceſſary to the pupil, I have thrown into the notes, and I have added ſome few hints to the teacher, under the title of

remarks. I have arranged the materials as methodically as I could, omitted every unneceſſary rule and remark, and completed the whole in as narrow a compaſs as the nature of my plan would permit. Whenever any hint ſtruck me, in the courſe of twenty years experience, I endeavoured to make it my own; fully ſenſible that the beſt mode of improvement is to adopt every uſeful obſervation we can collect, from every friend we converſe with, and from every book that falls into our hands.

To point out the defects of other publications, and the merits of my own, would be to aſſume a moſt ungrateful taſk. Such as it is I give it to the public, and will only beg leave to add, that any friendly hint for the future improvement of the work will be moſt gratefully acknowledged.

THOMAS PEACOCK.

Denton, near Darlington,
March 21, 1791.

CONTENTS.

ARITHMETIC.

ARITHMETIC is the art of computing by numbers.

NUMERATION.

Numeration teacheth to read and expreſs numbers in a proper manner.

NOTE.

All numbers are expreſſed by theſe ten characters, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; the firſt nine of which are called *ſignificant figures*, or *digits*, and the laſt a *cipher*.

Beſides its ſimple value, every character has a local one, which may be known by obſerving the following table.

TABLE of NUMERATION.

1	Units
21	Tens
321	Hundreds
4.321	Thouſands
54.321	Tens of thouſands
654.321	Hundreds of thouſands
7.654.321	Millions
87.654.321	Tens of millions
987.654.321	Hundreds of millions
1.987.654.321	Thouſands of millions
21.987.654.321	Tens of thouſands of millions
321.987.654.321	Hundreds of thouſands of millions

OBSERVE.

From the above table it appears, that, in any number of figures, the firſt figure, on the right hand, retains its proper value; the next is ten times its value; the third an hundred times its value, and ſo on; every ſucceeding figure being ten times as much as it would have been in the place preceding.

A cipher, or ciphers, when ſet on the right hand of a ſignificant figure, increaſe its value in the ſame tenfold proportion.

To read and expreſs large numbers with facility, the rule is to divide them into periods, containing ſix figures each. The two firſt periods are read as in the foregoing table. The firſt figure of the third period is called billions; the ſecond, tens of billions; the third, hundreds of billions; the fourth, thouſands of billions; the fifth, tens of thouſands of billions; and the ſixth, hundreds of thouſands of billions. The firſt figure of the fourth period is trillions; of the fifth, quadrillions; of the ſixth, quintillions; and ſo on, ſtill obſerving the ſame law, to as many periods as you chuſe.

CASE 1ſt.

To expreſs any propoſed number in figures.

RULE.

Write down ciphers to as many periods and places as are expreſſed in the given number. Then, begin at the left hand, and, taking away the ciphers, write in their places the ſignificant figures named in the queſtion.

EXAMPLES.

1. Expreſs in figures, four hundred and eighteen.

Anſwer 418.

2. Let ſix thouſand one hundred and twenty-four be figured down.

3. Write in figures, forty-nine thouſand and one.

4. Expreſs

4. Expreſs in figures, five hundred and nine millions, twelve thouſand and forty.

5. Write in figures, four millions, four hundred and four thouſand, four hundred and four.

6. Let twenty-five billions, and twenty-four thouſand be figured down.

7. Write down in figures, eight thouſand and nineteen millions, four hundred and eight thouſand and four.

8. Let fourteen trillions, ſeven hundred and five billions, twelve millions, eight thouſand and eight be figured down.

9. Expreſs in figures, ſixty thouſand and five billions, one hundred and four thouſand and fifty millions, three thouſand and twelve.

10. Let twelve thouſand eleven hundred and four be figured down.

CASE 2d.

To expreſs the value of figures in words.

RULE.

Value the figures in the queſtion, by calling the firſt figure on the right hand ſo many units, the ſecond ſo many tens, the third ſo many hundreds, &c. as in the table. Then expreſs this value in words for the anſwer.

EXAMPLES.

1. Let it be required to write down in words, 357.
   Anſ. Three hundred and fifty ſeven.
2. Read, or expreſs in words, 608.
3. Write down in words, 63128.
4. Expreſs in words, 304108126.
5. Write down in words, 5406804o7.
6. Let it be required to expreſs in words, 3303303.
7. Write down in words, 102003000400.
8. Expreſs in words, 303002786940005.
9. Read or expreſs, 4101071010141872.
10. Write down in words, 123456789123456 78.

NOTATION,

By ROMAN NUMERICAL LETTERS.

GENERAL RULES.

1*ſt*. As often as any character is repeated, ſo many times its value is repeated.

2*d*. A leſs character before a greater diminiſhes its value; but after a greater it increaſes it.

3*d*. A line drawn over any character increaſes it a thouſand fold.

NOTE.

I, V, X, L, C, D, M,

ſtands for

one, five, ten, fifty, a hundred, five hundred, a thouſand.

REMARK.

The rules given in the two caſes of numeration will ſerve equally well for the following examples.

EXAMPLES.

1. Write down in common figures, XXIX.
   Anſ. 29.
2. Expreſs in common figures, LXXXIV.
3. Let DCCCXI be ſet down in common figures.
4. Write down in common figures, MDCCXIX.
5. Let $\overline{\text{M}}$IIMDC be figured down.
6. Expreſs in common figures, MDCCDCCIX.
7. Write down in numerical letters, 404.
   Anſ. CCCCIV.
8. In numerical letters expreſs, 1790.
9. Set down in Roman characters, 2007.
10. Write in numerical letters, 60004.
11. In numerical letters expreſs, 12138724.
12. Set down in Roman characters, 710101218.

ADDI-

ADDITION of SIMPLE QUANTITIES.

Addition of simple quantities teacheth to collect several numbers, of the same denomination, into one number called the *sum*.

RULE.

Write the numbers to be added underneath each other, their units being in one column, their tens in another, their hundreds in a third, and so on. Draw a line under them all, and then add up each column separately, beginning with the column of units; observing, for every ten in the sum of any column, to add one to the sum of the next, setting down only the excess above the tens under each column; but for the last column write down the whole sum.

PROOF.

Begin at the top of the question, and reckon the figures downwards, in the same manner as you added them upwards, and if the sum be the same as that before found, the work is supposed to be right.

Or rather thus.

Add the figures in the uppermost row together, and find how many nines are contained in their sum. Then, reject the nines, and set down the remainder even with the figures in the row. Do in the same manner with every other row in the question, and find the sum of these remainders, out of which sum you must also reject the nines. If this last remainder be equal to the excess of nines in the total sum, the question is supposed to be right.

OBSERVE.

To the above ingenious method of proving addition of simple quantities, there is one objection, and that is, it sometimes makes a wrong operation appear right; but it never makes a right operation appear wrong.

TABLE of ADDITION.

0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

REMARK.

The teacher will find it advantageous to make some of his younger pupils get the above table by heart.

EXAMPLES.

(1)	41010816		(2)	3712144	(3)	7141214	
	12101084			1921085		1010185	
	13810140			1437640		1741010	
	71910123			1012185		1271085	
	10101082			7919184		1010142	
	12101084			9601046		7191085	
	71010123			1070195		1210142	
	19101082			1235142		1010142	
	12101038			1010185		1710185	
Sum	263246545						
Proof	263246545						

Second method of proof.

(4)	(5)	(6)
712107	619104	87141081
121014	191216	10101214
872114	170141	41791016
618101	879104	10121187
140124	121314	614161
710101	170104	71461
170101	614918	8741
876141	140146	678
Sum		
Proof		

(7)	(8)	(9)
871014	2141016	21017414
10872	1012719	10196187
614	3741386	6121716
28	1704652	418746
917831	2361618	68254
2104	1704107	1876
318	1210418	235
76	1010176	68
5	1701618	4
Sum		
Proof		

(10)	(11)	(12)
14101014	210101187	1710118721
21071016	7211016	1010101182
32101018	791014	2191071187
10101769	10712	1010101121
31012168	7014	7101012171
10121746	871	8701012041
17012161	68	1010101187
14013864	6	1011012181
10106169	4	7101012181
10106184	78	1011082141
10701014	161	7901010141
21211968	7814	1012181861
Sum		
Proof		

13. What

13. What is the sum of 61,—124,—71,—871,—4,—687,—41,—100,—and 75?

	61	7
	124	7
	71	8
	871	7
	4	4
	687	3
	41	5
	100	1
	75	3
Sum	2034	0
Proof	2034	

14. What is the sum of 871,—530,—21,—634,——813,—109,—and 2000? Anf. 4978.

15. Add 87121,—418,—3712,—41,—7182,—4——718,—and 1000 into one sum Anf. 100233.

16. A man was born in the year of our Lord 1712; when will he be 78 years of age? Anf. 1790.

17. What is the sum of five hundred and four, six thousand and five, two millions and a half, twelve hundred and eighty, and forty-seven? Anf. 2507836.

18. Add eleven thousand four hundred and ten, 17680, five hundred and seventy-six, six millions and four, 2714, and 1870 into one sum. Anf. 6034254.

19. A gentleman left his eldest son 17180 pounds; to each of his other three sons 6180 pounds; 4015 pounds a piece to each of his four daughters; 8019 pounds in small legacies; and 4000 pounds to his widow; how much did he leave in all? Anf. 63799.

20. How many shillings are there in a pound, a crown, a guinea, a moidore, and a six and thirty?

Anf. 109.

21. There are two numbers whose difference is 34, and the lesser number is 56; what is the greater number?

Anf. 90.

22. From Darlington to Durham is 18 miles, from thence to Newcastle 15 miles, thence to Morpeth 15 miles,

miles, thence to Berwick 48 miles, and from thence to Edinburgh 54 miles; how many miles is it from Darlington to Edinburgh? Anſ. 150.

23. A perſon was 12 years of age 17 years ſince, and he will be married 9 years hence; pray in what year of his age will that happen? Anſ. 38.

SUBTRACTION of SIMPLE QUANTITIES.

Subtraction of ſimple quantities teacheth to take a leſs ſimple number from a greater one, and thereby ſhews the *difference* or *remainder*.

RULE.

Write the leſs number under the greater, placing units under units, tens under tens, &c. and draw a line below the leſs number. Then, beginning with the units, ſubtract each figure from that above it, and write the remainder under them. But when the upper figure is leſs than the lower one, add ten to the upper figure in your mind, and then ſubtract, for which ten you muſt add one to the next lower figure.

PROOF.

Add the remainder to the leſs number, and if the ſum is equal to the greater number the work is right.

EXAMPLES.

(1)	From	41473646	(2)		739101141712
	Take	12101718			10121217104
	Rem.	29371928			
	Proof	41473646			
(3)	From	67103724	(4)		4733169264
	Deduct	14012176			1619107148
	Rem.				
	Proof				

(5)

(5) Bought 76780071
Sold 41416412

Unfold

Proof

(6) 371010141841
140101710126

(7) From 219101218
Subtract 107128714

Rem.

Proof

(8) 79101918714
101214010108

(9) From 87101218
Take 10101216

Difference

Proof

(10) 79010171041
10121910876

(11) From 61010141
Subtract 10810104

Rem.

Proof

(12) 71410121187
1012171014

13. From 6141041 subtract 1010148.

6141041
1010148

5130893 Remainder

6141041 Proof

14. From 618428 take 107674. Anſ. 510754.

15. What is the difference between 491218, and two millions, fourteen thouſand, and twelve?

Anſ. 1522794.

16. How

16. How much is 498271 ſhort of three millions?
Anſ. 2501729.

17. What number muſt I add to 414187, to make the ſum 1047679? Anſ. 633492.

18. How much does 618141 exceed 171219?
Anſ. 446922.

19. Subtract the ſum of 17187 and 13121, from the ſum of 29148 and 15010. Anſ. 13850.

20. How much is A, whoſe age is 87, older than B, whoſe age is 39? Anſ. 48 years.

21. The greater of two numbers is 187, and the leſſer 64; what is their difference and ſum?
Anſ. 123 diff.—251 ſum.

22. What is the difference between 417141 and twice 121118? Anſ. 174905.

23. Suppoſe a man was born in the year of our Lord 1721, how old is he this preſent year, being 1790?
Anſ. 69.

24. If I am 36 years older than you now; what will be the difference of our ages 18 years after my deceaſe, in caſe you ſhould then ſurvive? Anſ. 18 years.

25. A grant was made by the crown anno 1239, which was forfeited 137 years before the revolution in 1688; how long did the ſame ſubſiſt? Anſ. 312 years.

MULTIPLICATION of SIMPLE QUANTITIES.

Multiplication of ſimple quantities teacheth how to multiply any ſimple number by another, ſo often as there are units in the multiplying number.

NOTE.

The number to be multiplied, is called the *multiplicand.*
The number multiplied by, is called the *multiplier*
The number ariſing from the multiplication, is called the *product.*

The multiplier and multiplicand are alſo frequently called *factors* or *terms.*

TABLE

TABLE of MULTIPLICATION.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

CASE I.

When the multiplier does not exceed twelve.

RULE.

Write the multiplier under the multiplicand, placing units under units, &c. and draw a line under them. Then, begin at the right hand of the multiplicand, and multiply each figure in it by the multiplier, writing down the whole of such products as are less than ten; but for such as are just equal to a certain number of tens, write down a cipher, and carry one for each ten to the next product; and for such as exceed a certain number of tens, write down the excess, and carry for the tens as before.

To prove MULTIPLICATION.

Make the multiplier the multiplicand, and the multiplicand the multiplier, and proceed as before. If this product be equal to the former product the work is right.

Or

Or rather thus.

Caſt the nines out of the multiplicand and multiplier; then, multiply the two remainders together, and if the exceſs of nines in their product, be equal to the exceſs of nines in the total product, the operation is ſuppoſed to be right.

OBSERVE.

This laſt method of proving multiplication of ſimple quantities ſometimes makes a wrong operation appear right, but it never makes a right one appear wrong.

EXAMPLES.

(1) Multiply 4142187164 2
By 2 2 Proof
Product 8284374328 4

(2) Multiply 314101418
By 3
Product

(3) 471010101872
4

(4) Multiplicand 49101017
Multiplier 5
Product

(5) 6871010010876
6

(6) Multiply 87191418
By 7
Product

(7) 414101014I8
8

(8) Multiplicand 2141081
Multiplier 9
Product

(9) 871010010718
10

(10) Multiply 71921014 By 11

Product

(11) 87191718762 12

(12) Multiply 3871418721 by 8
Multiplicand 3871418721 6
Multiplier 8 8 Proof

Product 30971349768 3

13. What is the product of 4141872 multiplied by 6 and 7 in succeſſion? Anſ. 173958624.

14. What is the product of 491010148 multiplied by 4, 8, and 12 in succeſſion?

Anſ. 188547896832.

15. If one foot contains 12 inches; how many inches do 194 feet contain? Anſ. 2328.

16. There were 187 men employed to finiſh a piece of work, and they were paid after the rate of 9l. to each man; how much did they all receive?

Anſ. 1683l.

17. What is the difference, and what the ſum, of 6 dozen dozen, and half a dozen dozen?

Anſ. 792 diff. and 936 ſum.

CASE II.

When the multiplier is more than twelve.

RULE.

Write it below the multiplicand, as directed in caſe firſt, and draw a line under them; then, begin at the right hand, and multiply by each figure in the multiplier ſeparately, taking care to ſet down the firſt figure of each line directly under the figure you multiply by. Add all the lines together, and their ſum will be the product.

EX-

EXAMPLES.

(1) Multiply 4101141487 4
By 13 4

12303424461
4101141487

Product 53314839331 7

(2) Multiply 371014182 by 14
Multiplicand 371014182 0
Multiplier 14 5

1484056728
371014182

Product 5194198548 0

3. Multiply 4910101784 by 16.
Anſ. 78561628544.
4. Multiply 2141010101018 by 18.
Anſ. 3853818818324.
5. Multiply 41871871821 by 23.
Anſ. 963053051883.
6. Multiply 12101017187 by 27.
Anſ. 326727464049.
7. Multiply 71010101487 by 39.
Anſ. 2769393957993.
8. Multiply 41010107149 by 46.
Anſ. 188646928854.
9. Multiply 718710101014 by 64
Anſ. 45997446464896.
10. Multiply 41010172187 by 97.
Anſ. 3977986702139.
11. Multiply 3871071418 by 128.
Anſ. 495497141504.
12. Multiply 71210101487 by 467.
Anſ. 33255117394429.

13. Multiply 871010141187 by 695.
Anſ. 605352048599 65.

14. Multiply 41910101 by 1218.
Anſ. 51046503018.

15. Multiply 171010121 by 4641.
Anſ. 793657971561.

16. Multiply 41910121 by 9378.
Anſ. 393033114738.

17. Multiply 710101718 by 14013.
Anſ. 9950655374334.

18. Multiply 19101012 by 671014.
Anſ. 12817046466168.

19. Multiply 701010101 by 40013092.
Anſ. 28049581664242292.

20. Multiply 871010101 by 870100863.
Anſ. 757866640561817163.

21. Multiply 14101013 by 14101013.
Anſ. 198838567626169.

22. Multiply 71910018 by 71910018.
Anſ. 5171050688760324.

23. What is the product of 490142 by 210178?
Anſ. 103017065276.

24. What is the product of the difference of 212187 and 104168, and the ſum of 127108 and 131214?
Anſ. 27903684118.

25. What difference is there between 374 times 487, and 135 times 128? Anſ. 164858.

26. What number taken from the ſquare of 58, will produce 18 times 49? Anſ. 2482.

27. There are two numbers, the leſs is 135, and their difference 87; what is their product? Anſ. 29970.

CONTRACTIONS.

CONTRACTION I.

WHEN ciphers are placed at the right hand of either or both factors.

RULE.

RULE.

Proceed as before, neglecting the ciphers; and to the right hand of the product place as many ciphers as are in both the multiplicand and multiplier.

EXAMPLES.

1. Multiply 41017102 00 by 418000.

Multiplicand	41017102 00	7
Multiplier	418000	4
	328136816	
	41017102	
	164068408	
Product	17145148636000000	1

2. Multiply 7101018600 0 by 43756.
   Anſ. 3107121698616000.
3. Multiply 49101381 by 33180000.
   Anſ. 1629183821580000.
4. Multiply 8714191870 00 by 387200.
   Anſ. 3374135092064000 0.
5. Multiply 3018701872000 by 1010800.
   Anſ. 3051303852217600000.
6. Multiply 4910101870 0 by 3218500.
   Anſ. 1580316286859500 00.

CONTRACTION II.

When the multiplier is the product of any two or more numbers multiplied together.

RULE.

Multiply firſt by one of thoſe numbers, then that product by another, and ſo on, and the laſt product will be the anſwer.

EXAMPLES.

1. Multiply 4141408714 by 56

Multiplicand 4141408714
Multiplier 8×7=56

33131269712
7

Product 231918887984

2. Multiply 7193187141 by 72.
Anſ. 517909474152.
3. Multiply 4149181412 by 81.
Anſ. 336083694372.
4. Multiply 37010101418 by 121.
Anſ. 4478222271578.
5. Multiply 47187101012 by 1320.
Anſ. 62286973335840.
6. Multiply 37106814187 by 1120.
Anſ. 41559631889440.

DIVISION of SIMPLE QUANTITIES.

DIVISION of ſimple quantities teacheth to find how many times one ſimple number is contained in another.

NOTE.

The *diviſor*, is the number you divide by.

The *dividend*, is the number which is to be divided.

The *quotient*, ſhews the number of times the dividend contains the diviſor.

The *remainder* (if any) is the number which is left after the diviſion is performed.

CASE I.

When the diviſor is leſs than thirteen.

RULE.

R U L E.

Write the diviſor on the left hand of the dividend, with a curved line between them, and draw a line under the dividend. Then, ſeek how often the diviſor is contained in the firſt figure of the dividend, or, if in caſe the firſt figure of the dividend be leſs than the diviſor, then in the two firſt figures of the dividend, and ſet down the quotient accordingly, and if any thing remains carry it to the next figure in the dividend, where it muſt be reckoned as ſo many tens; that is, if one remains you muſt call it ten; if two, twenty; if five, fifty, &c. Thus proceed until you have made uſe of all the figures in the dividend.

N O T E.

Some call this *ſhort diviſion*, and others call it *mental diviſion*. It is properly a contraction of caſe 2d. Alſo, To complete the quotient, put the laſt remainder, if any, at the end of it, above a ſmall line with the diviſor below it.

To prove DIVISION.

Multiply the quotient by the diviſor; to the product add the remainder, and the ſum will be equal to the dividend if the work is right.

EXAMPLES.

(1) 2)4141487142(

2070743571 Quotient
2 Diviſor

Proof 4141487142 Dividend

(2) 3)4140141487(

Quot.

(3) 4)7141014371 8(

Quot.

(4) 5)8710101414 87(

Quot.

(5) 6)2364818721 82(

Quot.

(6) 7)8310371487 14(

Quot.

(7) 8)4634141871 48(

Quot.

(8) 9)7314101412 81(

Quot.

(9) 10)2387218575(

Quot.

(10) 11)871821416182(

Quot.

(11) 12)7187121818 2(

Quot.

(12) Divide 4101371467 by 2.
2)4101371467($\frac{1}{2}$ Remainder

2050685733 Quotient
2 Divisor

Pr.4101371467 Dividend

(13) Divide 4183710128 14 by 4.
Anſ. 1045927532 03 2-4.
(14) Divide 7141012141 41 by 7.
Anſ. 1020144591 63.

15. Divide 414371010714 by 8.
Anſ. 51796376339$\frac{3}{8}$.
16. Divide 37141014187 by 9.
Anſ. 4126779354$\frac{1}{9}$.
17. Divide 171010101487 by 11.
Anſ. 15546372862$\frac{5}{11}$.
18. Divide 371019101414 by 12.
Anſ. 309182584 51$\frac{2}{12}$.

19. Suppoſe a wheel with 248 teeth is to carry a pinion with 8 leaves; how many turns will the pinion make for one of the wheel? - Anſ. 31.

20. A man performs a journey of 672 miles in 12 days; how many miles does he travel in a day?
Anſ. 56.

CASE II.

When the diviſor is more than twelve.

RULE.

Place the diviſor as directed in caſe 1ſt, and draw a curved line on the right hand of the dividend to ſeparate it from the quotient, which muſt ſtand on the ſame line with the diviſor and dividend. Then find how often the diviſor is contained in the feweſt left hand figures of the dividend, put that number in the quotient, multiply the diviſor by that number, place the product under the figures in the dividend you are dividing, and then ſubtract it from thoſe figures. Bring down the

next

next figure in the dividend, and place it on the right hand of the remainder; and, if the remainder be then more than the divisor, proceed as before directed; but if it be less, write a cipher or ciphers in the quotient, and bring down one or more figures from the dividend, as may be wanted, and then divide; always taking care to put a figure in the quotient for every figure you bring down from the dividend. Thus proceed till you have brought down all the figures in the dividend.

OBSERVE.

Every remainder, after subtraction, must be less than the divisor; if it is not, the last figure is not the largest possible, which it ought to be.

EXAMPLES.

1. Divide 4141710151 by 13.

Divisor. Dividend. Quotient.

```
13)4141710151(318593088 7/13
  39                  13
  ---                 --
  .24              955779264
  13               318593088
  ---              ---------
  111              4141710144
  104                      7
  ---              ---------
  ..77             4141710151 Proof.
    65             ---------
    --
    121
    117
    ---
    ..40
      39
      --
      .115
       104
       ---
       .111
        104
        ---
        ..7 Remainder.
```

2. Divide

2. Divide 41417801418 by 16.
Anſ. $2588612588\frac{10}{16}$.

3. Divide 71410871416 by 19.
Anſ. $3758466916\frac{12}{19}$.

4. Divide 871010141872 by 23.
Anſ. $37870006168\frac{8}{23}$.

5. Divide 46143718218 by 37.
Anſ. $1247127519\frac{15}{37}$.

6. Divide 12187141872 by 58.
Anſ. $210123135\frac{42}{58}$.

7. Divide 87141414182 by 96.
Anſ. $907723064\frac{38}{96}$.

8. Divide 14914187386 by 124.
Anſ. $120275704\frac{90}{124}$.

9. Divide 937141874121 by 394.
Anſ. $2378532675\frac{171}{394}$.

10. Divide 41918718714 by 674.
Anſ. $62193944\frac{458}{674}$.

11. Divide 38714187142 by 1266.
Anſ. $30579926\frac{826}{1266}$.

12. Divide 21418714148 by 3742.
Anſ. $5723868\frac{92}{3742}$.

13. Divide 1410101408 by 40714.
Anſ. $34634\frac{12712}{40714}$.

14. Divide 714141682 by 63017.
Anſ. $11332\frac{11018}{63017}$.

15. Divide 491490187 by 701082.
Anſ. $701\frac{317051}{701082}$.

16. Divide 3714187148 by 3007182.
Anſ. $1235\frac{317317}{3007182}$.

17. Divide 491010101721 by 43710187.
Anſ. $11233\frac{13571150}{43710187}$.

18. Divide 1410190001428 by 13710018.
Anſ. $102858\frac{49609084}{13710018}$.

19. If

19. If 3192 be divided by 42; what is the quotient? Anſ. 76.

20. There are 187 men, who are to have 23188 pounds among them; how much muſt each man have? Anſ. 124 pounds.

21. What number muſt we multiply 43782 by, to make the product 529937328? Anſ. 12104.

22. What number, added to the 43d part of 4429, will make the ſum 240? Anſ. 137.

23. The ſum of two numbers is 360, the leſſer number is 144; what is their difference, product, and quotient? Anſ. 72 diff.—31104 prod.—1½ quot.

CONTRACTIONS.

CONTRACTION I.

WHEN there is a cipher or ciphers on the right hand of the diviſor.

RULE.

Cut off the cipher or ciphers from the diviſor, and the ſame number of figures from the right hand of the dividend. Then, divide the remaining figures as before directed, taking care that the figures you cut off from the dividend be annexed to the remainder.

EX-

EXAMPLES.

1. Divide 4141871874,21 by 3800.

Divisor.	Dividend.	Quotient.
38,00	4141871874,21	1089966281021/3800
38		3800
· 341		871973024
304		326989884
· 378		4141871864,00
342		1021 Remainder
· 367		4141871874,21 Proof
342		
· 251		
228		
· 238		
228		
· 107		
76		
· 314		
304		
· 1021 Remainder.		
3800		

2. Divide 714101480 by 570. Anſ. 1252809 1/7.
3. Divide 427107102 00 by 3600.
Anſ. 11864086 6/18.
4. Divide 8171205864 by 48600.
Anſ. 168131 19264/48000.
5. Divide 61010170114 by 680200.
Anſ. 89694 111114/680200.
6. Divide 21012107482 by 4038000.
Anſ. 5203 2191482/4038000.

CON-

CONTRACTION II.

When the divisor is the product of two or more small numbers.

RULE.

Divide continually by these numbers, and if there be any remainder after such divisions, multiply the last remainder by the next preceding divisor, and to the product add the remainder belonging to the same divisor. Then, multiply the sum by the next divisor, (if any) and to the product add its corresponding remainder. Proceed, in the same manner, through all the divisors and remainders, so shall the last sum be the true remainder.

EXAMPLES.

1. Divide 6141487124 by 56.

$$56 \begin{cases} 8 \mid 6141487124 \\ 7 \mid 767685890 \quad 4 \end{cases}$$

Quotient 109669412 6×8=48+4=52 Remainder.

2. Divide 41910101482 by 72.
   Anſ. $582084742\frac{58}{72}$.
3. Divide 148716096 by 96.
   Anſ. $1549126\frac{80}{96}$.
4. Divide 372180871412 by 108.
   Anſ. $3446119179\frac{80}{108}$.
5. Divide 619101081874 by 112.
   Anſ. $5527688231\frac{2}{112}$.
6. Divide 71871871412 by 1320.
   Anſ: $54448387\frac{572}{1320}$.

CONTRACTION III.

To perform diviſion in a ſhorter way.

RULE.

Place the numbers and divide as before; but, inſtead of writing down the product of the diviſor and each quotient figure, ſubtract each figure as it is produced.

This greatly ſhortens the work, and will anſwer extremely well when the diviſor is ſmall.

EXAMPLES.

1 Divide 476871284 by 694.

694)476871284(687134$\frac{188}{694}$
6047
4951
932
2388
3064
288

2. Divide 6371218718 by 487.
Anſ. 13082584$\frac{110}{487}$.
3. Divide 461871801187 by 1218.
Anſ. 379320509$\frac{325}{1218}$.
4. Divide 38101871819 by 3718.
Anſ. 10247948$\frac{1115}{1718}$.
5. Divide 62015735 by 7803. Anſ. 7947$\frac{1294}{7803}$.
6. Divide 48710187164 by 16794.
Anſ. 2900451$\frac{11070}{16794}$.
7. Divide 371871018721 by 219107.
Anſ. 1697211$\frac{208144}{219107}$.

TABLES of MONEY, WEIGHTS, and MEASURES.

Of MONEY.

4 farthings	makeone	penny
12 pence	makeone	ſhilling
20 ſhillings	makeone	pound

NOTE.

L. denotes libræ, or pounds; s. ſolidi, or ſhillings; d. denarii, or pence; and qrs. quadrantes, or farthings.

$\frac{1}{4}$ ſignifies one farthing; $\frac{2}{4}$ two farthings, or one half penny, and $\frac{3}{4}$ three farthings.

		£.	s.	d.		dwts.	grs.
A guinea	contains	1	1	0	and should weigh	5	9½
A half-ditto		0	10	6		2	16½
A crown		0	5	0		19	8½
A half-ditto		0	2	6		9	16½
A shilling		0	1	0		3	21
A six-pence		0	0	6		1	22½

A noble is 6s. 8d. a mark 13s. 4d. a moidore 1l. 7s. 0d.

TABLE of SHILLINGS.

s.	£. s.
20	1 0
30	1 10
40	2 0
50	2 10
60	3 0
70 are	3 10
80	4 0
90	4 10
100	5 0
110	5 10
120	6 0

s.	£. s.
130	6 10
140	7 0
150	7 10
160	8 0
170	8 10
180 are	9 0
190	9 10
200	10 0
210	10 10
220	11 0
230	11 10

TABLE of PENCE.

d.	s. d.
20	1 8
30	2 6
40	3 4
50	4 2
60	5 0
70 are	5 10
80	6 8
90	7 6
100	8 4
110	9 2
120	10 0

s.	d.
2	24
3	36
4	48
5	60
6	72
7 are	84
8	96
9	108
10	120
11	132
12	144

TABLE of FARTHINGS.

d.	grs.
2	8
3	12
4	16
5	20
6	24
7 are	28
8	32
9	36
10	40
11	44
12	48

TROY WEIGHT.

24 grains	make one	pennyweight	gr. dt. or dwt.
20 pennyweights	make one	ounce	oz.
12 ounces	make one	pound	lb.

NOTE.

Jewels, gold, silver, corn, bread, and liquors are weighed by this weight.

14 ozs. 11 dwts. 15½ grs. troy, are equal to one pound avoirdupoise.

APOTHECARIES WEIGHT.

20 grains	make one	scruple	gr. ℈
3 scruples	make one	dram	ʒ
8 drams	make one	ounce	℥
12 ounces	make one	pound	℔

NOTE.

Apothecaries compound their medicines by this weight, but they buy their drugs by Avoirdupoise weight.

The pound Apothecaries is the same weight as the pound Troy.

AVOIRDUPOISE WEIGHT

16 drams	make one	ounce	dm. oz.
16 ounces	make one	pound	lb.
28 pounds	make one	quarter of a cwt.	qr.
4 quarters, or 112 lbs.	make one	hundred-weight	cwt.
20 hundred-weights	make one	ton	ton.

NOTE.

N O T E.

Things of a coarſe and droſſy nature, ſuch as butter, cheeſe, grocery wares, and metals, (gold and ſilver excepted) are weighed by this weight.

A ſtone of meat is 8 pounds, a ſtone of wool, iron, groceries, &c. is 14 pounds. A fother of lead is 19½ cwts. A gallon of train oil is 7½ lbs.

CLOTH MEASURE.

2¼ inch	make one	nail	in.	n.
4 nails		quarter		qr.
4 quarters		yard		yd.
3 quarters		ell Flemiſh	e. fl.	
5 quarters		ell Engliſh	e. e.	
6 quarters		ell French	e. fr.	

N O T E.

Scotch and Iriſh linens are bought and ſold by the yard, but Dutch linens are bought by the ell Flemiſh, and ſold by the ell Engliſh.—4 qrs 1½ inch are a Scotch ell.

LONG MEASURE.

3 barley corns	make one	inch	b.c.	in.
4 inches		hand		hd.
12 inches		foot		ft.
18 inches		cubit		ct.
3 feet		yard		yd.
6 feet		fathom		fm.
5½ yards		rod, pole, or perch		p.
40 poles, or 220 yds.		furlong		fg.
8 furlongs, or 1760 yds.		mile		m.
3 miles		league		lea.
60 geographical miles, or 69½ Engliſh miles		degree		deg.

NOTE.

Diſtances of places, or any thing elſe that has length only, are meaſured by this meaſure.

360 degrees, or 25000 miles nearly, is the circumference of the earth.

SQUARE and LAND MEASURE.

144	ſquare inches	make one	ſquare foot	ſq in.
9	ſquare feet		ſquare yard	ſq. ft.
30¼	ſquare yards		ſquare pole	ſq. yd.
40	ſquare poles		ſquare rood	p.
4	ſquare roods, or			rd.
4840	ſquare yards		ſquare acre	a.
640	ſquare acres		ſquare mile	ſq. m.

NOTE.

Land, and all bodies where both length and breadth are conſidered, are meaſured by this meaſure.

A yard of land is 30 acres, and a hide of land is 100 acres.

A ſquare of roofing, flooring, &c. is 100 feet.

A rod of walling or brick work is 272¼ feet.

WINE MEASURE.

2	pints	make one	quart	pt.
4	quarts		gallon	qt.
10	gallons		anker	gn.
18	gallons		rundlet	an.
42	gallons		tierce	rt.
63	gallons		hogſhead	tr.
84	gallons		puncheon	hhd.
2	hogſheads		pipe or butt	pn.
2	pipes		tun	bt.
				tun

NOTE.

NOTE.

Brandies, ſpirits, perry, cider, mead, vinegar, oil, honey and milk are meaſured by this meaſure.

The wine gallon contains 231 cubic inches.

A tun of wine is ſuppoſed to weigh 18 cwts. avoirdupoiſe.

ALE and BEER MEASURE.

2	pints	make one	quart	pt.
4	quarts		gallon	qt.
8½	gallons		firkin	gn.
2	firkins		kilderkin	fn.
2	kilderkins, or 34 gs.		barrel	kn.
1½	barrels, or 51 gs.		hogſhead	bl.
2	hogſheads		butt	hhd.
2	butts		tun	bt.
				tun

NOTE.

A gallon of ale or beer contains 282 cubic inches.

A firkin of ſoap or herrings is the ſame with that of ale.

In London the ale firkin contains 8 gallons, and the beer firkin 9 gallons; the ale barrel 32 gallons, and the beer barrel 36 gallons; the ale hogſhead 48 gallons, and the beer hogſhead 54 gallons.

DRY MEASURE.

2	pints	make one	quart	pt.
2	quarts		pottle	qt.
2	pottles		gallon	pot.
2	gallons		peck	gn.
4	pecks		buſhel	pk.
2	buſhels		boll	bl.
4	buſhels		coomb	boll.
8	buſhels		quarter	cb.
5	quarters		wey	qr.
10	quarters		laſt	wy.
				lt.

NOTE.

NOTE.

Corn, ſeeds, fruits, roots, ſand, ſalt, coals, and all other dry goods, are meaſured by this meaſure.

The dry meaſure gallon contains $268\frac{4}{7}$ cubic inches, and the buſhel $2150\frac{42}{100}$ cubic inches.

The buſhel, water meaſure, is 5 pecks.

A chaldron of coals is 36 buſhels.

The ſtandard buſhel is $18\frac{1}{2}$ inches wide and 8 inches deep.

TIME.

60 thirds	make one	ſecond	″
60 ſeconds		minute	′ or min.
60 minutes		hour	hr.
24 hours		day	d.
7 days		week	wk.
4 weeks		month	m.
13 months 1 day 6 hours, or 365 days 6 hours		Julian or common year nearly	
365 ds. 5hs. 48ms. 57ss. 39ths.		ſolar year	y.

NOTE.

Thirty days hath September,
April, June, and November,
February hath twenty-eight alone,
And all the reſt have thirty-one.
But *leap-year* coming once in four,
Makes February have one day more.

REMARK.

A common or Julian year is 365 days 6 hours nearly, but only 365 days can be uſed in computing each year. This leaves an exceſs of near 6 hours yearly, which in four years time, makes one day. This day is added to the month of February every fourth year, which is called *leap-year*, from its leaping or advancing a day more than any other year.

AD-

ADDITION of COMPOUND QUANTITIES.

Addition of compound quantities teacheth to add ſeveral ſums, of different denominations, into one total ſum.

RULE.

Write the ſums in ſuch a manner that the ſame denominations may ſtand under each other, obſerving to place units below units, tens below tens, &c. and that the loweſt denomination be ſet on the right hand of your work, and ſo on regularly to the left hand as the denominations increaſe in value. Then draw a line under them, and add up the figures in the loweſt denomination firſt, and find how many of the next higher denomination are contained in the ſum. Set down the remainder, and carry the ones found to the next denomination.—Proceed in this manner till you have gone through all the denominations, obſerving that the higheſt denomination is to be added by the rule for addition of ſimple quantities.

PROOF.

Begin at the top of the ſum, and reckon the figures downwards, in the ſame manner as they were reckoned upwards, and if the ſum comes the ſame as before, it is ſuppoſed to be right.

EXAMPLES in MONEY.

	£.	s.	d.		£.	s.	d.		£.	s.	d.
(1)	41	17	8¼	(2)	8	17	9½	(3)	41	17	8¼
	18	10	0½		1	16	2½		16	16	8½
	38	16	11¾		2	11	7¾		13	0	0¼
	3	0	7		1	0	6		0	17	8
	46	11	6¼		6	18	3½		78	17	11¼
	18	17	11½		0	18	11¼		18	11	9½
	35	16	6		1	19	7¼		2	0	0½
	10	11	0¾		1	0	0¾		86	16	8¼
	6	16	7¼		2	17	8¼		7	11	7
Sum	220	18	11¼								
Pr.	220	18	11¼								

	£.	s.	d.
(4)	481	17	9½
	18	16	0¾
	2	12	8¼
	186	0	0
	127	18	11½
	146	17	9½
	374	0	0
	2	17	8½
	410	11	7½
	186	17	11½

	£.	s.	d.
(5)	371	11	8½
	148	16	4¾
	371	14	11½
	68	16	9½
	3	13	8¼
	124	17	8½
	35	11	9½
	4	0	0¼
	632	11	7
	4	11	9½

	£.	s.	d.
(6)	371	17	8½
	186	16	8½
	2	0	0
	61	18	8¼
	248	13	9½
	41	11	7½
	7	17	9½
	126	13	8½
	491	17	8½
	6	13	8¼

Sum

Proof

	£.	s.	d.
(7)	481	13	6¼
	214	16	8½
	161	12	7
	37	0	0½
	4	17	11¼
	617	13	0½
	48	17	8½
	6	11	6¼
	220	14	8½

	£.	s.	d.
(8)	713	16	8½
	121	14	0¾
	36	16	8½
	4	17	6½
	617	14	9½
	21	11	7½
	6	17	9½
	438	11	8½
	4	14	6½

	£.	s.	d.
(9)	3721	16	7½
	1618	17	0
	2714	0	8½
	614	17	8¼
	41	18	7
	6	13	6½
	8764	14	8¼
	418	14	6½
	3796	19	9½

Sum

Proof

10. Com-

10. Add 618l. 14s. 8d.—3l. 17s. 9¼d.—100l. 17s. 8½d.—3l. 19s. 7½d.—4l. 17s. 8d.—38l. 17s. 4½d.—4l. 11s. 11½d.—and 100l. 10s. 6d. into one sum.

£.	s.	d.
618	14	8
3	17	9¼
100	17	8½
3	19	7½
4	17	8
38	17	4½
4	11	11½
100	10	6
Sum 876	7	3¼
Proof 876	7	3¼

11. What is the sum of 81l. 17s. 0½d.—6l. 17s. 9½d. 381l. 10s. 7d.—2s. 7½d.—41l. 10s. 8d.—3l. 13s. 7½d. —4s. 11¼d.—and 38l. 12s. 8½d?

Anf. 554l. 9s. 11¼d.

12. I am indebted to John 41l. 17s. 8½d. to Thomas 3l. 13s. 8½d. to Robert 18l. 17s. 9¼d. to William 100l. 10s. to James 21l. 10s. 8½d. and to George 31l. 10s. 8d.; how much do I owe in all?

Anf. 218l. 0s. 6¼d.

13. My butcher's bill is 4l. 11s. 7d.—my baker's bill is 2l. 3s. 9d.—I owe the taylor 1l. 11s. 4¼d.—the shoemaker 2l. 7s. 8½d—the grocer 41l. 10s. 8½d.—and the draper 26l. 18s. 8½d.; how much do I owe in all? Anf. 79l. 3s. 9d.

14. Laid out in sugar, five groats and two pence—in tea, eight and thirty pence—in cheese, half a crown—in eggs, five farthings—and in bacon, half a guinea; how much did I lay out in all? Anf. 18s. 1½d.

15. A

15. A collector of the land tax received as follows: from A, 18l. 17s. 9¼d.—from B, 37l. 12s. 8¼d—from C, 10s. 8¼d.—from D, 171l. 13s. 6¼d.—and from E, 11l. 11s. 11¼d.; how much did he receive in all?

Anſ. 240l. 6s. 8¼d.

16. John owes Thomas, for rum, 18l. 10s. 6d.—for tea, 17l. 15s. 8d.—for cottons, 208l. 0s. 7¼d.—for ſugar, 13l. 10s. 7d.—for commiſſion 11l. 18s. 6¼d.—and for ſundry other tranſactions, 70l.; how much is John's whole debt to Thomas? Anſ. 339l. 15s. 11d.

EXAMPLES in WEIGHTS and MEASURES.

(1)

lbs.	ozs.	dwts	grs.
41	10	11	18
18	11	16	19
21	10	7	14
6	8	13	21
34	9	14	12
17	6	13	19
17	11	11	18
24	9	16	18
13	10	14	21
Sum 198	6	1	16
Proof 198	6	1	16

(2)

lbs.	ozs.	dwts.	grs.
3	11	18	16
1	10	17	14
3	10	18	17
1	0	14	23
2	11	0	19
0	10	17	23
7	11	14	18
2	9	16	18
1	0	11	14

(3)

lbs.	℥	ʒ	℈ grs.
2	10	1	0 14
1	11	3	1 15
3	9	4	2 11
4	10	2	1 14
1	10	6	0 17
6	11	7	2 14
4	8	6	1 13
1	10	4	1 12
7	11	6	1 17

(4)

tons.	cwts.	grs.	lbs.	ozs.
21	17	1	14	11
38	12	2	11	14
38	14	3	17	14
17	16	1	11	13
2	0	0	14	0
31	18	3	16	14
17	14	0	27	12
98	0	2	18	12
Sum				
Proof				

(5)

yds.	qrs.	ns.
21	2	1
2	3	2
68	3	1
7	0	0
49	2	2
7	1	3
6	3	2
88	1	1

(6)

acres.	rs.	ps.
171	2	18
218	1	27
371	1	31
38	0	17
2	1	39
371	1	17
126	3	36
220	1	19

	degs.	ms.	fs.	ps.
(7)	37	41	2	18
	21	27	3	38
	11	48	4	19
	68	21	2	19
	71	47	6	13
	84	54	0	29
	17	13	7	18
	57	48	2	13
	14	51	3	21
	11	18	6	37
Sum				
Proof				

	bbds.	gls.	qts.
(8)	31	37	1
	17	41	2
	87	54	3
	2	38	1
	61	61	3
	83	41	2
	27	54	3
	41	35	1
	38	47	3
	18	51	2
Sum			
Proof			

	b.	hls.	fs.	gr.	pts.
(9)	46	1	4	1	
	17	2	7	4	
	18	3	4	3	
	11	2	7	5	
	27	1	6	2	
	13	2	4	1	
	38	1	6	5	
	41	2	4	7	
	61	3	2	0	
	74	0	0	6	
Sum					
Proof					

	c.	chs.	hs.	ps.
(10)	32	11	1	
	11	27	3	
	41	18	2	
	37	24	3	
	41	17	1	
	24	16	3	
	13	17	0	
	18	13	2	
	17	14	1	
Sum				
Proof				

	ds	hs.	ms.	"
(11)	41	11	17	18
	38	17	41	48
	27	19	51	41
	2	10	11	18
	41	13	21	41
	3	19	51	48
	61	12	18	41
	78	13	21	21
	47	10	11	48
Sum				
Proof				

	ms.	ws.	ds.	hs.	ms.
(12)	3	1	2	17	18
	1	2	4	18	41
	6	0	0	19	38
	7	2	5	21	41
	1	1	4	23	38
	2	1	4	13	37
	1	2	6	18	49
	6	1	4	21	57
	4	1	5	12	41
Sum					
Proof					

13. Add 37lbs. 10ozs. 17dwts. 18grs.—17lbs. 10ozs. 11dwts. 19grs.—2ozs. 18dwts. 12grs.—6lbs. 13dwts. 14grs.—7lbs. 10ozs and 21lbs. 11ozs. 12dwts. 13grs. into one ſum.

	lbs.	*ozs.*	*dts.*	*grs.*
	37	10	17	18
	17	10	11	19
	0	2	18	12
	6	0	13	14
	7	10	0	0
	21	11	12	13
Sum	91	10	14	4
Proof	91	10	14	4

14. Find the sum of 27lbs. 11ozs. 18dwts. 21grs. —387lbs. 13dwts. 18grs.—9ozs. 19grs.—221lbs. 10grs.—41lbs. 100zs. 13dwts. 19grs. and 2lbs. 3ozs. 11dwts. 17grs.

Anſ. 680lbs. 11ozs. 19dwts. 8grs.

15. Suppoſe an apothecary compounds ſix different medicines, the firſt of which weighs 3lbs. 9℥s. 2℥s. 1℈. 18grs.—the ſecond, 21lbs. 2℥s. 4℥s. 13grs.—the third, 11℥s. 17grs.—the fourth, 9lbs. 10℥s. 2℈s.—the fifth, 7lbs. 4℥s. 13grs.—and the ſixth, 21lbs. 10℥s. 4℥s. 5℈. 13grs.; what do they all weigh?

Anſ. 64lbs. 8℥s. 1℈. 14grs.

16. I received from A 21 tons 18cwts. 2qrs. 19lbs.—from B 2 tons 13cwts. 10lbs. 12ozs.—from C 18cwts. 1qr. 18lbs.—from D 19tons 15cwts.—from E 4cwts. 17lbs.—from F 2 tons 1qr. 13ozs.—and from G 7 tons 4cwts. 1qr. 17lbs.; how much did I receive in all?

Anſ. 54tons 13cwts. 3qrs. 26lbs. 9ozs.

17. John bought 37yds. 2qrs. 3ns. of cloth—Thomas bought 86yds. 1n.—William bought 75yds. 3qrs.—George bought 281yds. 1qr. 2ns.—and Joſeph bought 500yds.; how much did they all buy?

Anſ. 980yds. 3qrs. 2ns.

18. From A to B is 21ms. 3fgs. 17ps.—from B to C is 2ms. 3fs. 38ps.—from C to D is 38ms. 18ps. —from D to E 48ms. 7fs.—from E to F is 4fs. 21ps. and

—and from F to G is 46ms. 1fg. 19ps.; what is the diſtance between A and G?

Anſ. 157miles 4fgs. 33ps.

19. One farm contains 28as. 2rs. 19ps.—another, 47as. 2rs. 21ps.—a third, 68as. 19ps.—a fourth, 35as. 3rs.—and a fifth, 100as.; how much do they all contain? Anſ. 280 acres 19poles.

20. A gentleman's cellar contains 13hhds. 38gns. 2qts. of port wine—4hhds. 51gs. 1qt. of ſherry—7hhds. 4gs. 1qt. of claret—5hhds. 38gs. of rum—2hhds. 18gs. 1qt. of brandy—and 49gs. 2qts. of champaigne; what quantity of liquor has he in all?

Anſ. 34hhds. 10gs. 3qts.

21. A common brewer ſent into the country the following quantities of ale; namely, to A 28bs. 3fs. 4gs.—to B 38bs. 2fs. 6gs.—to C 71bs. 4gs.—to D 38bs. 2fs.—to E 45bs. 1f. 7gs.—and to F 200bs.; how much did he ſend in all?

Anſ. 422bs. 2fs. 5gs.

22. A corn-factor ſells 41qrs. 3bs. 2pks. of wheat—27qrs. 1bl. 2pks. of rye—78qrs. 1pk. of barley—22qrs. 4bls. of oats—35 qrs. 7bls 1pk. of peaſe—and 121qrs. 2bls. 3pks. of malt; how much has he ſold in all? Anſ. 326qrs. 3bls 1pk.

23. John was married when he was 23yrs. and 187 days old—Joſeph was born 3yrs. and 131 days after that marriage—Edward came into the world when Joſeph was 2yrs and 18ds. old; and Edward was 7 years of age 57 days ago.—Pray how old is John now, reckoning 365 days to a year? Anſ. 36yrs. 28ds.

SUBTRACTION of COMPOUND QUANTITIES.

Subtraction of compound quantities teacheth to find the difference of two numbers, one or both of which are compound.

RULE.

Write the quantities as directed in compound Addition, place the greater quantity uppermost, and draw a line under them. Then, begin at the right hand, and subtract each lower quantity from that which is above it, and write down each remainder in its proper place. But if the lower quantity be greater than the higher one, add as many to the higher quantity as make one of the next greater, and then subtract, taking care to carry one to the next lower quantity for the number so borrowed.

PROOF.

The method of proof is the same as in subtraction of simple quantities.

EXAMPLES in MONEY.

		£.	s.	d.			£.	s.	d.
(1)	From	371	17	8¼	(2)		782	11	2½
	Take	182	10	11½			281	17	8½
	Rem.	189	6	8¾					
	Proof	371	17	8¼					

		£.	s.	d.			£.	s.	d.
(3)	From	2187	18	7½	(4)		7871	18	9½
	Take	1214	17	11½			1218	17	11¼
	Rem.								
	Proof								

(5) Lent

(5)

	£.	s.	d.
Lent	1200	0	0
Received	785	10	7¼
Rem. due			
Proof			

(6)

	£.	s.	d.
	2000	10	6¼
	1287	18	9¼

(7)

	£.	s.	d.
Borrowed	8718	17	8¼
Paid	1141	19	7½
Rem. due			
Proof			

(8)

	£.	s.	d.
	6871	17	8½
	1218	11	9¼

(9)

	£.	s.	d.
Borrowed	2000	10	7¼
Paid at sundry times	27	18	7½
	218	0	11¼
	187	11	6¾
	6	18	7
	121	19	7¼
	36	10	6
	2	18	9¼
	61	11	8½
	4	11	7
	231	19	6¾
Paid in all			
Rem. unpaid			
Proof			

(10) Lent

(10) Lent £. 7941 s. 11 d. 8½

Received at different times

£.	s.	d.
121	18	8½
6	11	7¼
781	17	8½
38	19	8¼
2	11	9½
418	17	7¼
21	11	9½
3	11	9¼
1	17	8½
1141	18	7½

Received in all

Rem. due to me

Proof

(11)

	£.	s.	d.
From	3710	11	8¼
Subtract	1287	17	7½

Rem.

Proof

(12)

	£.	s.	d.
	3718	17	8¼
	1211	10	9½

(13)

	£.	s.	d.
From	3000	0	0
Deduct	375	11	7¼

Rem.

Proof

(14)

£.	s.	d.
41011	10	7¼
31011	10	7½

15. What

15. What is the difference of 3871l. 11s. 8d. and 178l. 17s. 9½d.?

	£.	s.	d.
	3871	11	8
	178	17	9½
Anſwer	3692	13	10½
Proof	3871	11	8

16. From twenty pounds borrowed, take ten guineas paid;
It was lent by a virgin; what's due to the maid?
Anſ. 9l. 10s.

17. John's rent is 121l. 11s. 8d. a year.—Out of this he is allowed for land-tax 5l. 7s. 6½d. for church-ceſs 1l. 2s. 8d. for poor-ceſs 3l. 8s. 6d. for repairs 1l. 9s. 9d. and for manure 18s. 8d.; how much money has he to pay yearly to his landlord?
Anſ. 109l. 4s. 6½d.

18. A merchant at his out-ſetting in trade owed 271l. 11s. 2d.—His ſtock was valued at 11480l. 17s. 1d. and his firſt year's gain was 1387l. 11s. 8½d.; what was he worth at one year's end?
Anſ. 12596l. 17s. 7½d.

19. A tradeſman failing, owed to John 381l. 17s. 8½d.—to William 230l. 17s. 9d.—to Robert 481l. 19s. 8½d.—to Thomas 120l. 19s. 6d.—and to Iſaac 270l. His ſtock was worth 187l. 11s. 8d. he had 130l. 17s. 4d. in caſh, and his debts were 371l. 10s. 9d.; how much loſs will be ſuſtained by him? Anſ. 795l. 14s. 10½d.

20. A horſe in his furniture is worth 60l. 17s. 8d. out of it he is only worth twenty-four guineas; how much does the price of the furniture exceed that of the horſe? Anſ. 10l. 9s. 8d.

EXAMPLES in WEIGHTS and MEASURES.

(1)

	lbs.	ozs.	drs.	grs.
From	418	10	11	18
Take	128	9	14	21
Rem.	290	0	16	21
Proof	418	10	11	18

(2)

	lbs.	ozs.	drs.	grs.
	8718	11	18	10
	1271	4	18	21

(3)

	tons	cts.	qrs.	lbs.
From	18	10	1	14
Subtract	4	17	2	19
Rem.				
Proof				

(4)

	lbs.	℥s.	℥s.	℈s.	ʒs.	grs.
	2181	4	1	1	1	17
	1124	6	2	1	1	19

(5)

	yds.	qs.	ns.
From	3744	2	1
Take	1283	1	3
Rem.			
Proof			

(6)

	degs.	ms.	fs.	ps.
	387	41	2	18
	126	11	4	35

(7)

	qs.	rs.	ps.
From	321	1	14
Subtract	187	2	27
Rem.			
Proof			

(8)

	hhds.	gs.	qts.	pts.
	491	41	1	1
	387	54	2	0

(9)

	℔.	hhds.	gs.	qts.
From		481	41	1
Take		187	38	2
Rem.				
Proof				

(10)

	c.	lbs.	℔s.	ps.
		4812	21	1
		1274	54	2

(11) From

		ws.	ds.	hs.	ms.			ms.	ws.	ds.	hs.	ms.	"
(11)	From	87	4	18	21	(12)		11	2	4	11	18	21
	Take	13	6	21	38			4	1	6	18	41	57
	Rem.												
	Proof												

13. What is the difference between 57lbs. 10ozs. 17dwts. 11grs. and 21lbs. 6ozs. 13dwts. 21grs?

lbs.	ozs.	dwts.	grs.
57	10	17	11
21	6	13	21
Anf. 36	4	3	14
Proof 57	10	17	11

14. Subtract 38lbs. 4ozs. 13dwts. 15grs. from 78lbs. 4ozs. 10dwts. 21grs.

Anf. 39lbs. 11ozs. 17dwts. 8grs.

15. From 281lbs. 4℥s. 3℥s. 1℈. 17grs. deduct 118lbs. 10℥s. 2℥s. 2℈s. 18grs.

Anf. 162lbs. 6℥s. 1℈. 19grs.

16. Bought 18tons 17cwts. 1qr. 18lbs. of hay, and ſold 3 tons 18cwts. 11lbs.; how much remains unſold? Anf. 14 tons 19cwts. 1qr. 7lbs.

17. What is the difference between 481yds. 2qrs. 1n. and 127yds. 3ns? Anf. 354yds. 1qr. 2ns.

18. From A to C is 381ms. 2fs. 18ps. from A to B is 213ms. 4fs. 37ps.; how much is C farther from A than B is? Anf. 167ms. 5fgs. 21ps.

19. One field contains 38as. 2rs. 21ps. and another field contains 19as. 1r. 37ps.; what is the difference between them? Anf. 19as. 24ps.

20. Bought 38hhds. 41gs. of wine, and ſold in one month 17hhds. 32gs. 3qts.; how much remains unſold? Anf. 21hhds. 8gs. 1qt.

21. From 187qrs. 4lbs. 2ps. ſubtract 68qrs. 6lbs. 2ps. Anf. 118qrs. 6lbs.

22. A

22. A is 18ys. 41ds. 17hs. old, and B 12ys. 187ds. 19hs. 18ms. old; how much is A older than B reckoning only 365 days to a year?

Anſ. 5ys. 218ds. 21hs. 42ms.

MULTIPLICATION of COMPOUND QUANTITIES.

Multiplication of compound quantities teacheth to find a compound quantity which ſhall contain a given compound quantity any propoſed number of times.

RULE.

Write the multiplier under the loweſt denomination of the multiplicand, and draw a line under them. Then, multiply the loweſt quantity by the multiplier, reduce the product to the next higher denomination, and write down the remainder, carrying the units and adding them to the product of the next quantity multiplied as before. Do in the ſame manner with every quantity, except the laſt, which muſt be multiplied like ſimple numbers.

NOTE.

1ſt. When the multiplier is above twelve, multiply by two or three numbers whoſe product is equal to the multiplier; that is, firſt by one, and then that product by another, and the laſt product will be the anſwer.

2d. When theſe two or three numbers fall ſhort of or exceed the multiplier, add or ſubtract the given quantity as often as is neceſſary.

3d. When the given quantity conſiſts of $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$, divide the price of one by 4 for $\frac{1}{4}$, by 2 for $\frac{1}{2}$, and for $\frac{1}{4}$ by 2 firſt for $\frac{1}{2}$ and then the quotient again by 2 for $\frac{1}{4}$, and add them to the product for the anſwer.

EX-

EXAMPLES in MONEY.

	£.	s.	d.		£.	s.	d.
(1) Multiply	618	17	8¼	(2)	6187	19	0½
By			2				3
Product	1237	15	4½				

	£.	s.	d.		£.	d.	d.
(3) Multiply	414	10	7¼	(4)	8714	17	8¼
By			4				5
Product							

	£.	s.	d.		£.	s.	d.
(5) Multiply	1871	11	8½	(6)	6831	0	8¼
By			6				7
Product							

	£.	s.	d.		£.	s.	d.
(7) Multiply	3871	11	9¼	(8)	4171	11	9¼
By			8				9
Product							

	£.	s.	d.		£.	s.	d.
(9) Multiply	871	11	7	(10)	6961	16	8¼
By			11				12
Product							

11. Find the value of 4 yards of cloth, at 11s. 8¼d. per yard.

£.	s.	d.
0	11	8¼
		4
2	6	9 Anſwer.

12. What

12. What are 6lbs. of tea worth, at 7s. 9¼d. per lb.?
Anf. 2l. 6s. 9d.

13. Value 7 horſes at 8l. 11s. 8d. each.
Anf. 60l. 1s. 8d.

14. Required the worth of 9 ſheep, at 1l. 10s. 9½d. each?
Anf. 13l. 17s. 1½d.

15. What muſt I give for 11 cows, at 7l. 17s. 10¾d. each?
Anf. 86l. 16s. 4¼d.

16. Find the value of 12 yards of cloth, at 13s. 8¾d. per yard.
Anf. 8l. 4s. 3d.

17. Value 16lbs. of tea at 8s. 7¼d. per lb.

£.	s.	d.	
0	8	7¼	
			4×4=16
1	14	5	
		4	
6	17	8	Anſwer.

18. What muſt I give for 21 ſteers, at 4l. 11s. 9d. each?
Anf. 96l. 6s. 9d.

19. What are 25lbs. of coffee worth, at 2s. 7½d. per lb.?
Anf. 3l. 5s. 7½d.

20. Find the price of 36 pigs, at 9s. 6d. each.
Anf. 17l. 2s. 0d.

21. Required the worth of 48 yards of lace, at 7¼d. per yard?
Anf. 1l. 9s. 0d.

22. Value 64 tons of hay, at 2l. 7s. 8¾d. per ton.
Anf. 152l. 12s. 0d.

23. Bought 81 ewes, at 1l. 2s. 8d. each; what do they come to?
Anf 91l. 16s. 0d.

24. What are 96 ounces of ſilver worth, at 5s. 7d. per ounce?
Anf. 26l. 16s. 0d.

25. Value 112lbs. of fine tea, at 9s. 7¼d. per lb.
Anf. 53l 15s. 8d.

26. What are 1320 yards of cloth worth, at 2s. 4¼d. per yard?
Anf. 155l. 7s. 6d.

27. Re-

27. Required the worth of 240 yards of ſhalloon, at 1s. 2d. per yard? Anſ. 14l. 0s. 0d.

28. Find the worth of 19 ells of Holland, at 4s. 9¼d. per ell.

£.	s.	d.	
0	4	9¼	
			6×3=18+1=19
4	8	7½	
		8	
4	5	10½	
0	4	9¼	
4	10	7¼	Anſwer.

29. Value 23 horſes, at 4l. 8s. 7d. each. Anſ. 101l. 17s. 5d.

30. Bought 34 calves, at 1l. 9s. 7d. each; what do they come to? Anſ. 50l. 5s. 10d.

31. What are 47lbs. of tea worth, at 7s. 4¼d. per lb.? Anſ. 17l. 7s. 7¼d.

32. Value 58 tons of hay, at 2l. 2s. 4d. per ton. Anſ. 122l. 15s. 4d.

33. Find the price of 69 yards of ribbon, at 7½d. per yard. Anſ. 2l. 4s. 6½d.

34. Required the worth of 95 ells of Holland, at 14s. 9¼d. per ell? Anſ. 70l. 3s. 2½d.

35. What are 117cwts. of raiſins worth, at 1l. 8s. 7d. per cwt.? Anſ. 167l. 4s. 3d.

36. What are 24½ cheeſes worth, at 8s. 7¼d. each?

£.	s.	d.	
0	8	7¼	÷2
			6×4=24
2	11	7½	
		4	
10	6	6	
0	4	3½	
10	10	9½	Anſwer.

37. Value $37\frac{1}{4}$cwts. of ſugar, at 2l. 17s. 9d. per cwt.
Anſ. 107l. 11s. $2\frac{1}{4}$d.

38. Required the price of $43\frac{1}{4}$ firkins of butter, at 1l. 11s. 8d. per firkin? Anſ. 69l. 5s. 5d.

39. Find the worth of $74\frac{1}{4}$ yards of cloth, at 8s. $2\frac{1}{4}$d. per yard. Anſ. 30l. 7s. 11d.

40. Value $89\frac{1}{2}$cwts. of ſugar, at 3l. 6s. 7d. per cwt.
Anſ. 297l. 19s. $2\frac{1}{2}$d.

41. What are $98\frac{1}{4}$lbs. of tea worth, at 9s. $9\frac{1}{4}$d. per lb.? Anſ. 48l. 4s. $10\frac{1}{4}$d.

EXAMPLES in WEIGHTS and MEASURES.

(1) Multiply *lbs. ozs. dts. grs.* 61 10 17 18 By 6
Product 371 5 6 12

(2) *lbs. ozs. dts. grs.* 871 10 17 21 By 8
Product

(3) Multiply *lbs.* ℥ *s.* ℨ *s.* ℈ *gs.* 61 10 2 1 18 By 9
Product

(4) *tons cwts. qrs. lbs. ozs.* 871 17 1 18 11 By 7
Product

(5) Multiply *yds. qrs. ns.* 8718 2 1 By 11
Product

(6) *degs. ms. fs. ps.* 871 38 2 18 By 8
Product

(7) Multiply *as. rs. ps.* 371 1 17 By 9
Product

(8) *tuns hhds. gs. qts.* 61 1 18 2 By 6
Product

(9) Multiply *A. hhds. gs. qts.* 381 17 1 By 7
Product

(10) *days. hs. ms. ″ ‴* 371 17 18 31 17 By 11
Product

11. Mul-

11. Multiply 61lbs. 11ozs. 17dwts. 18grs. by 7.

lbs.	*ozs.*	*dwts.*	*grs.*
61	11	17	18
			7
433	11	4	6 Anſwer.

12. What is the product of 21lbs. 10ozs. 17dwts. 4grs. multiplied by 9?
Anſ. 197lbs. 1oz. 14dwts. 12grs.

13. Multiply 211lbs. 4℥s. 1℈. 18grs. by 8.
Anſ. 1690lbs. 8 ℥s. 5 ℥s. 4grs.

14. Multiply 681tons 18cwts. 2qrs. 18lbs. by 11.
Anſ. 7501tons 5cwts. 1qr. 2lb.

15. Multiply 381 ells Eng. 2qrs. 3ns. by 7.
Anſ. 2670 ells Eng. 4qrs. 1n.

16. Multiply 871 degs. 48ms. 2fs. 18ps. by 12.
Anſ. 10461 degs. 39ms. 5fs. 16ps.

17. Multiply 831as. 1r. 18ps. by 7.
Anſ. 5819as. 2rs. 6ps.

18. Multiply 218hhds. 27gs. 1qt. by 8.
Anſ. 1747hhds. 29gs.

19. Multiply 418qrs. 3bs. 2ps. by 7.
Anſ. 2929qrs. 2ps.

20. Multiply 718ws. 2ds. 11hs. 17ms. by 12.
Anſ. 8620ws. 1d. 15hs. 24ms.

21. Multiply 87lbs. 11ozs. 18dwts. 19grs. by 72.
Anſ. 6335lbs. 7ozs. 13dwts.

22. Multiply 418cwts. 1qr. 18lbs. 11ozs. by 88.
Anſ. 36820cwts. 2qrs. 20lbs. 8ozs.

23. Multiply 218 days 11hs. 17ms. 18ſecs. by 121.
Anſ. 26434ds. 21hs. 53ms. 18ſecs.

24. Multiply 6lbs. 11ozs. 18dwts. 17grs. by 39.
Anſ. 272lbs. 9ozs. 9dwts. 15grs.

25. Multiply 813yds. 2qrs. 1n. by 76.
Anſ. 61830yds. 3qrs.

26. Multiply 836c. chs. 18bls. 1pk. by 91.
Anſ. 76122c. chs. 4bls. 3pks.

27. Multiply 82ws. 1d. 11hs. 17ms. by 104.
Anſ. 8445ws. 5ds 21hs. 28ms.

28. Multiply 618lbs. 11℥s. 3℥s. 1ℑ. 17grs. by 19¼.
Anſ. 11914lbs. 10℥s 3℥s 1ℑ. 17grs.

29. Multiply 634ms. 4fgs 17ps. by 37½.
Anſ 23795ms. 5fgs. 37½ps.

30. Multiply 68hhds. 18gs 4pts by 72¾.
Anſ. 4968hhds. 22gs. 7pts.

DIVISION of COMPOUND QUANTITIES.

DIVISION of compound quantities teacheth to divide a compound quantity into any propoſed number of equal parts.

R U L E.

Place the diviſor and dividend as in ſimple quantities. Then, begin at the higheſt denomination, divide every denomination by the diviſor, and write the quotients under the numbers you divide. But if there is a remainder in any denomination, except the leaſt, reduce it to the next lower name, and add it to the denomination you are going to divide, before you divide it.

N O T E.

1ſt. When the diviſor exceeds twelve, divide by two or more numbers whoſe product is equal to the diviſor.

2d. When the diviſor cannot be produced by the multiplication of two or more numbers, divide as in long diviſion.

3d. When the diviſor contains ¼, ½, or ¾, multiply the diviſor by 4, and add 1 for ¼, 2 for ½, and 3 for ¾. Divide the dividend, multiplied alſo by 4, by this product and the quotient will be the anſwer.

P R O O F.

This is done by the rule for proving diviſion of ſimple quantities.

EX-

EXAMPLES in MONEY.

(1)

£.	s.	d.	
2)6871	18	9¼(¼	

Anſ. 3435 19 4½
2

Proof 6871 18 9¼

(2)

£.	s.	d.	
3)8694	11	8¼(	

(3)

£.	s.	d.	
4)6841	18	6½(	

(4)

£.	s.	d.	
5)861	18	9¼(	

(5)

£.	s.	d.	
6)8614	17	8¼(	

(6)

£.	s.	d.	
8)9418	17	4½(	

(7)

£.	s.	d.	
9)6741	18	7¼(	

(8)

£.	s.	d.	
11)3218	17	4½(	

(9)

£.	s.	d.	
12)7418	17	8¼(	

10. Divide 8761l. 18s. 8¼d. by 4.

£.	s.	d.	
4)8761	18	8¼(¼	

Anſ. 2190 9 8
4

Proof. 8761 18 8¼

11. Divide 26187l. 11s. 9¼d. by 6.
Anſ. 4364l. 11s. 11½ ⅓d.

12. Divide 1374l. 18s. 7¼d. by 7.
Anſ. 196l. 8s. 4¼ ⅐d.

13. Divide 6187l. 11s. 8d. by 11.
Anſ. 562l. 10s. $1\frac{3}{11}$d.

14. If 9 horſes coſt 67l. 11s. 8d. what are they worth a piece? Anſ. 7l. 10s. $2\frac{3}{9}$d.

15. A man leaves 8761l. 10s. $4\frac{1}{2}$d. equally among twelve children; what is each child's fortune?
Anſ. 730l. 2s. $6\frac{1}{4}$ $\frac{6}{12}$d.

16. If 11 firkins of butter coſt 16l. 10s. 7d.; what is one firkin worth? Anſ. 1l. 10s. $0\frac{1}{2}$ $\frac{6}{11}$d.

17. Divide 6121l. 10s. 4d. into 10 equal parts.
Anſ. 612l. 3s. $0\frac{1}{4}$ $\frac{6}{10}$d.

18. If 16 yards of cloth coſt 14l. 18s. 7d.; what is 1 yard worth?

	£.	s.	d.
4	14	18	7
4	3	14	$7\frac{1}{4}$
	0	18	$7\frac{1}{4}$ $\frac{1}{4}$ Anſ.

19. I gave 1218l. 11s. 9d. for 24 horſes; what did they coſt me a piece? Anſ. 50l. 15s. $5\frac{1}{4}$ $\frac{1}{4}$d.

20. If 32cwts. of ſugar coſt 128l. 16s. 4d.; what is 1 cwt. worth? Anſ. 4l. 0s. $6\frac{1}{4}$d.

21. Divide 618l. 11s. 9d. into 63 equal parts.
Anſ. 9l. 16s. $4\frac{1}{4}$d.

22. What is butter per firkin, when 81 firkins coſt 96l. 10s. 4d.? Anſ 1l. 3s. $9\frac{3}{4}$d.

23. Bought 108 ſheep for 147l. 17s. 8d.; what did they coſt a piece? Anſ. 1l. 7s. $4\frac{1}{2}$d.

24. A cwt. of tea coſt 68l. 19s. 7d.; what is that per lb.? Anſ. 0l. 12s. $3\frac{3}{4}$d.

25. Bought 125 pigs for 71l. 10s. 6d.; what did they coſt me a piece? Anſ. 0l. 11s. $5\frac{1}{4}$d.

26. If 216 cheeſes coſt 120l. 10s. 7d.; what is one cheeſe worth? Anſ. 0l. 11s. $1\frac{1}{4}$d.

27. When 504 cows coſt 2184l. 17s. 8d.; what is one cow worth? Anſ. 4l. 6s. $8\frac{1}{4}$d.

28. Divide

28. Divide 3187l. 11s. 7d. into 43 equal parts.

£.	s.	d.	£.	s.	d.
43)3187	11	7(74	2	7 $\frac{6}{43}$ Anſ.	
301					
177					
172					
5					
20					
43)111(2s.					
86					
25					
12					
43)307(7d.					
301					
6					
43					

29. Divide 718l. 17s. 9¼d. equally among 57 men. Anſ. 12l. 12s. 2 $\frac{3}{4}$ $\frac{14}{57}$d.

30. If 87 cows coſt 518l. 11s. 7d.; what is one cow worth? Anſ. 5l. 19s. 2 $\frac{1}{2}$ $\frac{23}{87}$d.

31. The price of 97 ſheep is 138l. 17s. 8d.; what is the price of each ſheep? Anſ. 1l. 8s. 7 $\frac{1}{2}$ $\frac{50}{97}$d.

32. Divide 631l. 11s. 9d. into 365 equal parts. Anſ. 1l. 14s. 7 $\frac{3}{4}$ $\frac{69}{365}$d.

33. The cloathing of 687 ſoldiers coſt 961l. 11s. 8d.; what did they coſt a piece? Anſ. 1l. 7s. 11 $\frac{3}{4}$ $\frac{479}{687}$d.

34. If

34. If $9\frac{1}{4}$ yards of cloth coſt 12l. 17s. 8d.; what is one yard worth?

	£.	s.	d.				
$9\frac{1}{4}$	12	17	8				
4			4				
37	37)51	10	8(	1	7	$10\frac{1}{4}\frac{1}{37}$	Anſ.
	37						
	14						
	20						
	37)290(	7s.					
	259						
	31						
	12						
	37)380(	10d.					
	37						
	10						
	4						
	37)40(	$\frac{1}{4}$					
	37						
	3						
	37						

35. I gave 12l. 10s. 11d. for $8\frac{1}{2}$ firkins of butter; what is one firkin worth? Anſ. 1l. 9s. $6\frac{4}{17}$d.

36. The price of $7\frac{1}{4}$ cwts of ſugar was 34l. 11s. 9d.; what did it coſt per cwt.? Anſ. 4l. 9s. $3\frac{1}{17}$d.

EX-

EXAMPLES in WEIGHTS and MEASURES.

(1) 4)618 10 11 14(*lbs. ozs. dwts. grs.*

Anf. 154 8 12 21¾

4

Proof 618 10 11 14

(2) 6)437 10 11 18(*lbs. ozs. dwts. grs.*

(3) 8)618 17 1 14(*tons cwts. qrs. lbs.*

(4) 9)8711 1 1(*ells eng. qr. n.*

(5) 7)418 41 1 18(*degs. ms. f. ps.*

(6) 11)8714 1 18(*acres rs. ps.*

(7) 12)481 41 2(*hhds. gs. qts.*

(8) 6)873 17 2(*tt. hhds. gs. qts.*

(9) 7)481 17 2(*c. cbs. bs. ps.*

(10) 11)871 11 18 17(*days. hs. ms. n*

11. Divide 281 lbs. 10 ozs. 14 dwts. 11 grs. by 8.

lbs. ozs. dwts. grs.

8)281 10 14 11(

Anf. 35 2 16 19⅜

8

Proof 281 10 14 11

12.

12. Divide 681 lbs. 10 ℥s. 3 ℥s. 2 ℈s. 17 grs by 11.
Anſ. 61 lbs. 11 ℥s. 6 ℥s. 2 ℈s. $14\frac{3}{11}$ gs.

13. Divide 871 tons 17 cwts. 1 qr. 18 lbs. 10 ozs. by 12.
Anſ. 72 tons 13 cwts. 13 lbs. 3 ozs. 8 dms.

14. Divide 481 yards 2 qrs. 1 n. by 7.
Anſ. 68 yds. 3 qrs. $c\frac{1}{7}$ n.

15. Divide 638 degs. 18 ms. 7 fs. 18 ps. by 11.
Anſ. 58 degs. 1 m. 5 fgs. $30\frac{8}{11}$ ps.

16. Divide 488 acres 1 r. 19 ps. by 10.
Anſ. 48 as. 3 rs. $13\frac{9}{10}$ ps.

17. Divide 634 b. hhds. 18 gs. 1 qt. by 7.
Anſ. 90 b. hhds. 33 gs. $1\frac{6}{7}$ qt.

18. Divide 871 c. chs. 18 bs. 2 ps. by 5.
Anſ. 174 c. chs. 10 bls. $3\frac{1}{5}$ ps.

19. Divide 438 yrs. 187 ds. 17 hs. 18 ms. by 12, reckoning only 365 days to a year.
Anſ. 36 ys. 198 ds. 3 hs. $26\frac{6}{12}$ ms.

20. Divide 683 tons 17 cwts. 1 qr. 18 lbs. by 36.
Anſ. 18 tons 19 cwts. 3 qrs. 19 lbs. 15 ozs.

21. Divide 482 degs. 37 ms. 1 fg. 18 ps. by 63.
Anſ. 7 degs. 39 ms. 5 fs. 4 ps.

22. Divide 681 hhds. 41 gs. 2 qts. by 81.
Anſ. 8 hhds. 26 gs. 0 qts.

23. Divide 831 dys. 17 hs. 18 ms. 21 ss. by 144.
Anſ. 5 ds. 18 hs. 37 ms. 12 ſes. 38 ths.

24. Divide 838 lbs. 10 ozs. 11 dwts. 18 grs. by 37.
Anſ. 22 lbs. 8 ozs. 1 dwt. $9\frac{21}{37}$ grs.

25. Divide 691 acs. 1 r. 18 ps. by 65.
Anſ. 10 as. 2 rs. $21\frac{53}{65}$ ps.

26. Divide 874 a. hhds. 40 gs. 2 qts. by 79.
Anſ. 11 a. hhds. 3 gls. $2\frac{16}{79}$ qts.

27. Divide 381 c. chs. 17 bs. 2 pks. by 94.
Anſ. 4 c chs. 2 bls. $0\frac{32}{94}$ pks.

28. Divide 318 tons 12 cwts. 2 qrs. 18 lbs. by $7\frac{1}{4}$.
Anſ. 43 tons 18 cwts. 3 qrs. $26\frac{18}{29}$ lbs.

29. Divide 412 ms. 2 fgs. 18 ps. by $8\frac{1}{2}$.
Anſ. 48 ms. 4 fgs. $2\frac{2}{17}$ ps.

30. Divide

30. Divide 818dys. 11hs. 18ms. 19ss. by $12\frac{1}{4}$.
Anſ. 64ds. 4hs. 39ms. $5\frac{1}{11}$ss.

REDUCTION.

REDUCTION teacheth to change quantities from a higher denomination to a lower one, from a lower denomination to a higher one, and from one denomination to another their value being equal.

NOTE.

When a quantity is brought from a higher to a lower denomination; as pounds to pence, tons to ounces, it is performed by multiplication only, and is called *Reduction deſcending*. When a quantity is changed from a lower denomination to a higher one; as pence to pounds, yards to miles, it is done by diviſion only, and is called *Reduction aſcending*. And when a quantity is changed from one denomination to another; as pounds to guineas, hogſheads to puncheons, both multiplication and diviſion are uſed, and it is called *Reduction aſcending and deſcending*.

RULE.

In *Reduction-deſcending*, multiply the higheſt denomination by as many as make one of the next leſs, and, to the product, add the odd parts of that leſs name, if any. Then, multiply the ſum by as many as make the next leſs denomination, adding as before. Thus proceed till you come to the denomination ſought.

In *Reduction-aſcending* divide the denomination given by as many as make one of the next higher name, and the remainder, if any, call ſo many of the firſt denomination. Then, divide that quotient by as many as are equal to one of the next higher name, valuing the re-

remainder as before. And thus proceed till you come to the name fought for.

In *Reduction aſcending and deſcending*, multiply or divide as the queſtion may require, proceeding regularly either upwards or downwards, by one name at a time, and adding or valuing the remainders by the above directions.

P R O O F.

Invert the queſtion and work according to the rules given.

E X A M P L E S.

M O N E Y.

1. In 17l. 11s. $8\frac{1}{4}$d.; how many farthings?

£.	s.	d.	
17	11	$8\frac{1}{4}$	
20			
351			
12			
4220			
4			
16881 Anſ.			

4)16881

12)4220$\frac{1}{4}$

2,0)35,1 $8\frac{1}{4}$

£. 17 11 $8\frac{1}{4}$ Proof.

2. In 9 pounds; how many ſhillings, pence, and farthings? Anſ. 180 ſhillings, 2160 pence, 8640 qrs.

3. Reduce 15l. 16s. $8\frac{1}{4}$d. into farthings.
Anſ. 15202.

4. How many pence are in 7 pounds and half a crown?
Anſ. 1710.

5.

5. In 34 guineas; how many farthings?
Anſ. 34272.

6. Find how many farthings are in 23 moidores.
Anſ. 29808.

7. Reduce 61 half-crowns into ſixpences and pence.
Anſ. 305 ſixpences, 1830 pence.

8. In 38 crowns how many ſhillings, groats and pence?
Anſ. 190 ſhillings, 570 groats, 2280 pence.

9. Find how many ſixpences are in 37l. 11s 6d.
Anſ. 1503.

10. Reduce 10l. 11s. 4d: into groats. Anſ. 634.

11. Find how many farthings are in 57 crowns, as many half-crowns, ſhillings and pence. Anſ. 23484.

12. In 374 dollars, each 4s 9½d.; how many farthings?
Anſ. 86020.

13. How many groats and farthings are in 174 marks? Anſ. 6960 groats, 111360 qrs.

14. In 375 nobles; how many half-pence?
Anſ. 60000.

15. In 12875 farthings; how many pounds?

qrs.	£.	*s.*	*d.*
4)12875	13	8	2¾
12)3218¾	20		
2,0)268 2¼	268		
Anſ. 13 8 2¼	12		
	3218		
	4		
	12875 Proof.		

16. Reduce 16320 farthings to pounds. Anſ. 17.

17. Find how many pounds are in 4579 pence.
Anſ. 19l. 1s. 7d.

18. In 8755 half-pence; how many pounds?
Anſ. 18l 4s. 9½d.

19. How many pounds are in 4183 groats?
Anſ. 69l. 14s. 4d.

20. Reduce 2349 ſixpences to pounds, &c.
Anſ. 58l. 14s. 6d.

21. Find how many threepences, ſixpences, half-crowns, and crowns are in 8160 half-pence.
Anſ. 1360 threepences, 680 ſixpences, 136 half-crowns, 68 crowns.

22. In 35280 farthings; how many guineas?
Anſ. 35.

23. Reduce 30780 pence to moidores. Anſ. 95.

24. How many groats and nobles are in 6400 pence?
Anſ. 1600 groats, 80 nobles.

25. In 96 crowns; how many pence and pounds?

cr.	*£.*
96	24
5	20
480	480
12	12
12)5760 pence	12)5760 pence
2,0)48'0	5)480
24 pounds	96 crowns

26. Reduce 60 guineas into ſhillings, crowns, and pounds. Anſ. 1260 ſhillings, 252 crowns, 63 pounds.

27. In 36 marks; how many pence and pounds?
Anſ. 5760 pence, 24 pounds.

28. Find how many pence and crowns are in 40 nobles.
Anſ. 3200 pence, 53 crs. and 20d. over.

29. How many ſhillings and guineas are in 63 pounds?
Anſ. 1260 ſhillings, 60 guineas.

30. In 27 moidores; how many pence and pounds.
Anſ. 8748 pence, 36 pounds, and 9s. over.

31. In 218 dollars each 4s. 6½d.; how many pounds?
Anſ. 49l. 10s. 1d.

32. In

32. In 318 quarter-guineas; how many pence, ſhillings and guineas?

Anſ. 20034 pence, 1669 ſhs. 79 gs. 10s. 6d. over.

33. In nine purſes, each containing 8 guineas, a moidore, and a crown; how many pounds? Anſ. 90.

34. Reduce 50 moidores to half-crowns and pounds.

Anſ. 540 half-crowns, 67 pounds, 10s. over.

35. In 618 dollars, each 5s $2\frac{1}{4}$d.; how many farthings and pounds? Anſ. 154500 qrs. 160l 18s. 9d.

36. How many crowns, half-crowns, and ſhillings are in 213l. 15s. 6d. and of each an equal number?

Anſ. 503.

37. How many pieces, each 14s. 6d. are in 86 pieces, each 3l. 12s. 0d.? Anſ. $427\frac{6}{174}$.

38. In 273 marks and 87 nobles; how many pounds?

Anſ. 211.

39. If I had nobles eighty ſcore, and marks juſt fifty-two,
In part of fourteen hundred pounds, what money reſts ſtill due?

Anſ. 832l.

TROY WEIGHT.

1. In 35 lbs. 10 ozs. 11 dwts. 18 grs.; how many grains?

lbs.	*ozs.*	*dts.*	*grs.*
35	10	11	18
12			
430			
20			
8611			
24			
34452			
17223			
206682	Anſ.		

24 = 6 × 4

	grs.
6	206682
	34447

2,0)861,1—3×6=18 grs.

12)430 11 dwts.

Proof 35 10 11 18
lbs. ozs. dts. grs.

2. Find how many dwts. are in 41 lbs. 11 ozs. 9 dwts.
Anſ. 10069.

3. Reduce 182120 grs. to pounds.
Anſ. 31 lbs. 7 ozs. 8 dwts. 8 grs.

4. In 11 ozs. 17 dwts. 18 grs. of gold; how many gold rings, each 2 dwts. 11 grs. Anſ. 96—42 grs. over.

5. If an ingot of ſilver weighs 4 lbs. 10 ozs. 11 dwts. 18 grs.; how many table ſpoons may be made of it, each weighing 2 ozs. 13 dwts 14 grs?
Anſ. 21—1116 grs. over.

6. How many lbs. of ſilver are there in four dozen of table ſpoons, each weighing 3 ozs. 11 dwts. 9 grs. and three dozen of tea ſpoons, weighing in all 11 ozs. 17 dwts. 21 grs.? Anſ. 15 lbs. 3 ozs. 3 dwts. 21 grs.

7. A goldſmith hath ſix ingots of ſilver, each weighing 25 ounces, which he propoſes to make into ſpoons of 2 ozs. cups of 5 ozs. ſalts of 3 ozs. and ſnuff boxes of 2 ozs. and to have an equal number of each; how many muſt he have? Anſ. 12 of each ſort—6 ozs. over.

8. How many wedges of gold, each weighing 11 ozs. 17 dwts. 18 grs. may be made out of 374 gold rings, each weighing 9 dwts. 18 grs.?
Anſ. 15.—1926 grs. over.

APOTHECARIES WEIGHT.

1. Reduce 21 lbs. 4 ℥ s. 2 ℨs. 1 ℈. to ſcruples.

lbs. ℥s. ℨs. ℈.
21 4 2 1
12

256
8

2050
3

6151 Anſ.

℈s.
3)6151

8)2050 1 ℈.

12)256 2 ℨs.

21 4 2 1 Proof
lbs. ℥s. ℨs. ℈.

2. Find

2. Find how many grains are in 81 lbs. 11 ℥s. 2 ℥s. 2 ℈s. 17 grs.? Anſ. 472017.

3. Bring 121135 grains into lbs.

Anſ. 21 lbs. 2 ℥s. 2 ℈s. 15 grs.

4. In 9 parcels of medicine, each 2 lbs. 3 ℥s. 11 grs.; how many grains? Anſ. 105399.

5. How many parcels, each 4 ℥s. 1 ℈. 11 grs. are contained in 4 lbs. 11 ℥s. 5 grs.

Anſ. 104—141 grs. over.

AVOIRDUPOISE WEIGHT.

1. Reduce 2 tons 11 cwts. 2 qrs. 17 lbs. 9 ozs. to ounces.

tons cwts. qrs. lbs. ozs.		*ozs.*
2 11 2 17 9		
20	16	4 92569
51		4 23142 1
4	28	7 5785 2×4+1=9 ozs.
206		4 826 3
28		4)206 2×7+3=17lbs.
1655		2,0)51 2 qrs.
413		
5785		2 11 2 17 9 Proof
16		*tons ℥s. qrs. lbs. ozs.*
34719		
5785		
92569 Anſ.		

2. Find how many drams are contained in 13 tons 17 cwts. 1 qr. 27 lbs. 11 ozs. 12 dms.

Anſ. 7956412.

3. Bring 1872182 drams to tons, &c.
Anſ. 3 tons 5 cwts. 1 qr. 5 lbs. 3 ozs. 6 dms.

4. How many lbs. and ozs. are in 21 fothers of lead?
Anſ. 45864 lbs. 733824 ozs.

5. In 27 hhds. each 387 lbs.; how many cwts. &c.?
Anſ. 93 cwts. 1 qr. 5 lbs.

6. Find how many ounces are in 9 hhds. of tobacco, each weighing neat $8\frac{1}{4}$ cwts. Anſ. 133056.

7. In 17 cwts. 2 qrs. of ſugar; how many parcels, each $63\frac{1}{4}$ lbs.? Anſ. 30—1000 ozs. over.

8. Find how many lbs. troy are in 3 cwts. 2 qrs. 19 lbs. avoirdupoiſe? Anſ. $338,\frac{105\,8}{1909}$.

9. How many fothers are contained in 19 pigs of lead, each weighing 14 cwts. 3 qrs. 21 lbs?
Anſ. 14—10 cwts. 3 qrs. 7 lbs. over.

10. In 9 cwts. 3 qrs. 21 lbs.; how many parcels of 6 lbs. 8 lbs. 12 lbs. and 16 lbs. and the number of each equal? Anſ. 26—21 lbs. over.

11. In 18 cwts. 1 qr. 19 lbs. of train oil; how many gallons. Anſ. $275\frac{1}{11}$.

CLOTH MEASURE.

1. In 38 yds. 2 qrs. 1 n.; how many nails?

yds	*qrs.*	*n.*
38	2	1
4		
154		
4		
617	Anſ.	

ns.
4)617
4)154 1 n.

38	2	1	Proof
yds.	*qrs.*	*n.*	

2. Find how many nails are in 47 ells Eng. 2 qrs. 3 ns. Anſ. 951.

3. Reduce 897 nails to ells Flemiſh.
Anſ. 74 ells Fl. 2 qrs. 1 n.

4. In

4. In 68 yds. 3 qrs. 2 ns.; how many inches?
Anſ. 2479½.

5. There are 38 pieces of cloth, each containing 35 ells Flem. 1 qr. 2 ns.; how many nails and yards are contained in the whole?
Anſ. 16188 ns.—1011 yds. 3 qrs.

6. How many pieces, each 11 yds. 2 qrs. 1 n. are in 186 ells Eng. 2 qrs. 3 ns.? Anſ. 20—31 ns. over.

7. In 64 pieces of cloth, each 41 yards; how many pieces, each 18 ells Flemiſh?
Anſ. 194—5 yds. over.

8. In 8 bales of cloth, each 19 pieces, each 18 ells Flemiſh; how many ells Engliſh?
Anſ. 1641 ells Eng. 3 qrs.

LONG MEASURE.

1. Find how many inches are in 9 ms. 3 fs. 87 yds. 11 ins.

ms.	*fs.*	*yds.*	*ins.*
9	3	87	11
8			
75			
220			
1587			
150			
16587			
36			
99523			
49762			
597143	Anſ.		

ins.

36 { 6 | 597143
6 | 99523 5

220 { 10 | 16587 1×6+5=11 ins.
11 | 1658 7
2 | 150 8

8)75—8×10+7=87 yds

9 3 87 11 Proof
ms. fs. yds. ins.

2. How many barley corns are in 4 ms. 7 fs. 38 yds. 2 ft. 11 ins.? Anſ. 930849.

3. Bring

3. Bring 638418 barley corns to miles, &c.
Anſ. 3 ms 2 fgs. 191 yds. 10 ins.

4. Find how many inches are equal to 20 miles.
Anſ. 1267200.

5. How often does a wheel, which is $16\frac{1}{2}$ feet round, turn in $15\frac{1}{4}$ miles? Anſ. 4880 times.

6. When a horſe is ſaid to be $15\frac{1}{2}$ hands high; how many feet and inches is his height? Anſ. 5 ft. 2 ins.

7. According to the beſt calculations, the circumference of the earth is 8340 leagues nearly; how many barley corns will reach round it?
Anſ. 4755801600.

8. Suppoſe a man ſteps 2 ft. 6 ins. at each ſtep; how many ſteps will he take between London and Darlington, which is 240 miles? Anſ. 506880.

9. Find how many degrees, of $69\frac{1}{2}$ miles each, are contained in 820710300 barley corns.
Anſ. 62 degs. 8 ms. 5 fgs 149 yds. 1 ft. 4 ins. over.

10. Suppoſe a man travels 20 miles a day; how long would he be in travelling round the world, reckoning it 360 degrees, each $69\frac{1}{2}$ miles, and reckoning $365\frac{1}{4}$ days to a year? Anſ. 3 yrs. $155\frac{1}{4}$ days.

SQUARE and LAND MEASURE.

1. Find how many poles are in 27as. 1r. 19ps.

as.	*r.*	*ps.*
27	1	19
4		
109		
40		
4379 Anſ.		

ps.
4,0)437,9
4)109 19 ps.
27 1 19 Proof.
as. r. ps.

2. How many poles are in 157 acres? Anſ. 25120.
3. Bring 8360 poles to acres, &c. Anſ. 52as. 1rd.
4. Reduce 35as. 2rs. 19ps. to poles. Anſ. 5699.
5. How

5. How many yards are in 74 acres? Anſ. 358160.

6. One field contains 8as. 17ps.—a ſecond 7as. 1r. 27ps.—a third 11as. 2rs.—and a fourth 15¼ acres; how many ſhares of 59 perches are contained in the whole? Anſ. 114—38 perches over.

7. John rents a farm of 200as. 18ps.—he plows 81as. 1r. 11ps.—he grazes 107as. 1r.—and he has the remainder in meadow; pray how many perches of meadow has he? Anſ. 12567.

8. In 41 yards of land; how many poles? Anſ. 196800.

9. Find how many hides of land are in 175380 poles. Anſ. 10 hides 96as. 20ps.

10. How many rods of brickwork are in 38210 feet? Anſ. 140—95 feet over.

WINE MEASURE.

1. Find how many pints are in 5 hhds. 11 gs. 2 qts. of wine.

hhds.	gs.	qts.
5	11	2
63		
326		
4		
1306		
2		
2612 Anſ.		

pts.
2)2612
4)1306
63 { 9|326 2 qts.
7| 36 2

Proof hhds. 5 1×9+2=11 gs 2 qts.

2. Reduce 9 tons 2 hhds. 11 gs. 3 pts. to pints. Anſ. 19243.

3. How many tons of wine are in 16374 pints? Anſ. 8 tons 30 gals. 3 qts.

4. In 49 puncheons of rum; how many qts.? Anſ. 16464.

5. Re-

5. Reduce 4161 qts. to tierces.

Anſ. 24 trs. 32 gls. 1 qt.

6. Find how many qts. pts. and half pints, and of each an equal number, are in 5 hhds. of wine.

Anſ. 720.

7. In 6 hhds. of brandy; how many half anchors?

Anſ. 75—3 gls. over.

8. How many pipes, puncheons, hogſheads, rundlets, and ankers, and of each a like number, are in 4345 gallons? Anſ. 14—131 gls. over.

ALE and BEER MEASURE.

1. In 7 hhds. 31 gs. 1 qt. of London ale; how many pts.?

hhds.	*gs.*	*qt.*
7	31	1
48		
367		
4		
1469		
2		
2938	Anſ.	

pts.

2)2938

4)1469

48 { 8|367 1 qt.
6| 45 7

Proof hhds. 7 3×8+7=31 gs. 1 qt.

2. Reduce 9 hhds. 41 gs. 3 pts. of London beer to pints. Anſ. 4219.

3. In 3182 qts. of London ale; how many hhds. &c.? Anſ. 16 hhds. 27 gs. 2 qts.

4. Bring 75 bs. 2 fs. 1 g. of country ale or beer to pints. Anſ. 20544.

5. Find how many hhds. of London beer are in 47820 pints. Anſ. 110 hhds. 37 gls. 4 pts.

6. How many barrels of country ale or beer are in 3275 pints? Anſ. 12 bls. 1 gn. 3 pts.

7. In 51 hhds. of London beer; how many pts. and bls.? Anſ. 22032 pts. 76 bls. 18 gns.

8. Find

8. Find how many hhds. bs. and fns. and of each a like number, are in 8 tons 1 hl. 18 gs. of London beer.
Anſ. 18.

DRY MEASURE.

1. In 47 qrs. 5 brs. 2 pks. of corn; how many pecks?

qrs.	bls.	pks.
47	5	2
8		
381		
4		
1526	Anſ.	

pks.
4)1526
8) 381 2 pks.
47 5 2 Proof
qrs. bls. pks.

2. Find how many gallons are in 9 laſts. 4 qrs. 2 bls. 1 pk. of corn. Anſ. 6034.

3. Bring 4187210 pints of corn to laſts, &c.
Anſ. 817 laſts. 8 qrs. 1 hl. 1 gn. 2 pts.

4. In 97 chaldrons of coals; how many pecks?
Anſ. 13968.

5. How many chaldrons of coals are in 87121 pks.?
Anſ. 605 c. chs. 1 pk.

6. In 37 ſacks of coals, each $3\frac{1}{2}$ buſhels; how many pecks? Anſ. 518.

7. How may carts, each containing 18 bls. 2 pks. will 83 chaldrons, 17 bls. of coals fill?
Anſ. 162—8 bls. over.

8. Find how many chaldrons of coals are equal to 187 ſacks, each $9\frac{1}{4}$ bls.
Anſ. 48 c. chs. 1 hl. 3 pks.

9. How many ſacks of 11 pecks each, will hold 7 laſts. 3 qrs. 1 hl. of corn? Anſ. 212—2 bls. over.

TIME.

T I M E.

1. Find how many seconds are equal to a Julian year.

days	*hs.*
365	6
24	
1466	
730	
8766	
60	
525960	
60	
31557600	Anſ.

seconds

6,0)31557600

6,0)525960

24 { 6)8766 / 4)1461

Proof ds. 365 1×6=6 hs.

2. In 175 ds. 11 hs. 17 ms. 18 ſs.; how many thirds?
Anſ. 909577080.

3. Bring 2418671200 thirds to years, &c.
Anſ. 1 yr. 101 ds. 13 hs. 33 ms. 6 ss. 40 ths.

4. How many minutes are equal to 17 ms. 1 wk. 4 ds. 11 hs. 17 ms.? Anſ. 701957.

5. From one change of the moon to another is 29 days 12 hs. 44 ms. 3 ſs.; how many ſeconds in all?
Anſ. 2551443.

6. From the birth of Chriſt till Chriſtmas 1790; how many ſeconds, minutes, and hours, reckoning 365 days, 5 hs. 48 ms. 58 ſes. to a year?

Anſ. { 56486919020 ſeconds
941448650 minutes—20 ss. over
15690810 hours—50 ms. over.

7. From March 12th, to November 19th following, inclusive; how many days? Anſ. 253.

8. How many ſeconds of time are there between the 10th day of October, and the 14th day of March following? Anſ. 13305600.

THE

THE SINGLE RULE OF THREE.

THE single rule of three teacheth, by having three numbers or quantities given, to find a fourth either in direct or inverted proportion.

NOTE.

Direct proportion is when the fourth number or term bears the same proportion to the third, as the first does to the second.

Inverted, or reciprocal proportion, is when the fourth number or term bears the same proportion to the second, as the first does to the third.

Direct and inverted proportion are only different parts of one rule, and are best wrought by the same method.

RULE for STATING.

Write down the given number or quantity which is of the same name with the number required, placing the marks of proportion both before and after it; that is, the mark : before, and the mark :: after it. Then, if the answer be more than that number, place the lesser of the other two terms on the left hand thereof, with the word *as* or *if* before it, and place the greater term on the right hand, without any word or mark after it: But if the answer be less than the middle number or term, make the greater number or quantity the first term, and the lesser the third.

METHOD of OPERATION.

Reduce the first and third terms into the same denomination, and the second into the lowest name mentioned. Then, multiply the second and third terms together, and divide the product by the first term, and the quotient will be the answer in the same denomination you left the second term in, which may be brought into a different denomination by the rules of reduction.

OBSERVE.

1ſt. Always multiply and divide as in multiplication and diviſion of compound quantities, when it can conveniently be done.

2d. If a remainder be left after diviſion, reduce it to the next name below the laſt quotient, divide by the ſame diviſor, and the quotient will be ſo many of that next name. Do this, as long as there is a remainder, till it be brought into the loweſt name, and all the quotients together will be the anſwer.

3d. If the firſt term be unity, or one, the product of the ſecond and third terms, properly reduced, will be the anſwer. And if the third term be unity, or one, the quotient of the ſecond term divided by the firſt will alſo be the anſwer.

PROOF.

The method of proof is by inverting the queſtion.

REMARK.

The teacher is here recommended to inſtruct his pupil in the firſt caſe of reduction of vulgar fractions, to enable him to abbreviate the remainders of the different operations in this and the following rules.

EXAMPLES.

1. If a yard of cloth coſt 1s. 6d.; what are 34 yards worth at the ſame rate?

yd.	*s.*	*d.*		*yds.*
As 1	: 1	6	::	34
	12			18
	18			272
				34
				12)612
				2,0)51
				£. 2 11 Anſ.

yds.	*£.*	*s.*	*d.*		*yd.*
As 34	: 2	11	0	::	1
		20			
34)51(1					
	34				
	17				
	12				
34)204(6d.					
	204				

Proof.

2. What

2. What are 78 yards of cloth worth, at 4s. 9½d. per yard? Anſ. 18l. 13s. 9d.

3. I gave 12l. 5s. 4d. for 64 yards of cloth; what did it coſt me per yard? Anſ. 3s. 10d.

4 When ſugar is bought at 5½d. per lb; what is 1 cwt. worth? Anſ. 2l. 11s. 4d.

5. Bought 2½ cwts. of ſugar for 8l. 15s. 0d.; what did it coſt me per lb? Anſ. 7½d.

6. If 4 yards of flannel are worth 6s. 10d.; what are 37 yards worth? Anſ. 3l. 3s. 2½d.

7. What are 8 yards of flannel worth, when 74 yards of the ſame coſt 8l. 17s. 11½d? Anſ. 19s. 2⅓, ⅓½d.

8. If 16 bags of hops coſt 42l. 8s.; what are 72 bags worth? Anſ. 190l. 16s.

9. The price of 96 cows was 516l. 16s.; how much did I give for 8 cows? Anſ. 43l. 1s. 4d.

10. A man earns 8s. 4d. in 13 days; how much can he earn in 174 days? 5l. 11s. 6⅔, ⅔½d.

11. At 6 ſhillings a week; how much is that by the year? Anſ. 15l. 12s.

12. My yearly income is 119l. 2s. 6d.; how much is that for a day, reckoning only 365 days to the year? Anſ. 6s. 6¼, ¾½d.

13. If a man travels 87 miles in 17 days; how far will he travel in 19 weeks 5 days?

Anſ. 706 ms. 1 fg. 194 17/17 yds.

14. What are 43 quarters 6 buſhels of wheat worth, at 5s. 10d. per buſhel? Anſ. 102l. 1s. 8d.

15. What are 17 dozen pairs of ſhoes worth, at 2s. 3d. per pair? Anſ. 22l. 19s.

16. If 48 dozen pairs of ſtockings coſt 43l. 16s.; what are 3 dozen and 7 pairs worth?

Anſ. 3l. 5s. 4½d.

17. The price of an ounce of ſilver is 5s. 9d.; what are 18 table ſpoons worth, weighing in all 2 lbs. 9 ozs. 17 dwts. 18 grs.? Anſ. 9l. 14s. 10 19/80d.

18. A ſilver tankard coſt 7 guineas; how much did it coſt per ounce, ſuppoſing it to weigh 29 ozs. 11 dwts. 18 grs.? Anſ. 8s. 4⅓, 11/17d.

19. What is a fother of lead worth, at $2\frac{1}{4}$d. per lb. ?
Anſ. 25l. os. 6d

20. I gave after the rate of $2\frac{1}{4}$d. per lb. for 13 pigs of lead; what did they all weigh, ſuppoſing they coſt me 130l. 17s. 6d. ?
Anſ. 6 fothers, 7 cwts. 2 qrs. 16 lbs.

21. How much in length, that is 3 inches broad, will make a foot ſquare ? Anſ. 48 inches.

22. What are 19 cheeſes worth, each weighing $19\frac{1}{4}$ lbs., at $4\frac{1}{2}$d per lb. ? Anſ. 7l. 4s. $9\frac{1}{4}$, $\frac{1}{4}$d.

23. The price of 3 tons 18 cwts. 1 qr. 11 lbs. of iron was 50 guineas; what did it coſt per lb. ?
Anſ. $1\frac{1}{4}$—$\frac{2}{15}$d.

24. If when the price of a buſhel of wheat is 6s. 3d. the penny-loaf will weigh 9 ozs. ; what muſt the penny-loaf weigh when wheat is at 4s. 3d per buſhel ?
Anſ. 13 ozs. 4 dwts. $16\frac{16}{17}$ grs.

25. What are 21 pieces of cloth, each $27\frac{1}{4}$ yards long, worth at 7s. 4d. per ell Engliſh ?
Anſ. 167l. 17s. $2\frac{1}{2}$—$\frac{1}{2}$d.

26. I bought 216 ells French of velvet for 400l. and it coſt me 7l. os. 6d. for carriage and other charges; how much does it ſtand me in per yard ?
Anſ. 1l. 5s. $1\frac{1}{2}$d.

27. Suppoſe 120 men do a piece of work in 8 months; how many men will do the ſame in 2 months ?
Anſ. 480 men.

28. Reckoning 3 barley corns to meaſure an inch, and computing 7680 barley corns to fill a pint; how much might I expect, at 3s. 9d. per buſhel, for ſo much barley as would reach from London to Darlington, ſuppoſing it to be 240 miles ? Anſ 17l. 8s. $0\frac{1}{2}$ $\frac{1}{4}$d.

29. What muſt be paid for the carriage of 16 cwts. for 117 miles 4 fgs. when 5 guineas were paid for carrying the ſame weight 52 miles ?
Anſ. 11l. 17s. $3\frac{1}{8}$$\frac{1}{8}$d.

30. A carrier receives 1l. 9s. $7\frac{1}{2}$d. for the carriage of 4 cwts. 3 qrs. 21 lbs. 40 miles; how far will he carry 3 cwts. 2 qrs. for the ſame ſum ?
Anſ. 56 ms. $3\frac{1}{7}$ fgs.

31. What

31. What rent muſt be paid for 110 acres 2 rs. 19 ps. at 14s. 9d. per acre per annum?

Anſ. 81l. 11s. $7\frac{1}{2}\frac{3}{40}$d.

32. I pay 275l. 10s. a year rent for 385 acres of land; and I pay ſundry other outgoings, amounting in all to 23l. 11s. 6d; how much does my farm coſt me per acre? Anſ. ol. 15s. $6\frac{1}{4}\frac{4}{7}$d.

33. How many yards of ſtuff that is 3 qrs. wide, are equal to 19 yds. of cloth that is 5 qrs. wide?

Anſ. $31\frac{2}{3}$.

34. Suppoſe I give 50 guineas for a pipe of wine; what does it ſtand me in per pint? Anſ. ol. 1s. $0\frac{1}{4}$d.

35. At 2s. $3\frac{1}{2}$d. per quart; what is wine worth per pipe? Anſ. 57l. 15s. od

36. In what time will 600l. gain 50l. intereſt, when 80l. does it in 15 years? Anſ. 2 years.

37. What are 89 ankers of ale worth, at 7s. 6d. a piece, ſuppoſing 17s. 6d. be returned to the buyer by the ſeller? Anſ. 32l. 10s. od.

38. How many yards of paper that is 3 qrs. wide, will hang a room that is 30 feet long and 24 feet wide?

Anſ. $106\frac{2}{3}$ yards

39. Find the value of 618 qrs 4 bs. 3 pks. of wheat at 6s. $7\frac{1}{2}$d. per buſhel? Anſ. 1639l. 5s. $5\frac{1}{2}\frac{1}{2}$d.

40 If 56 chaldrons of coals coſt 187l 19s 6d.; what is one buſhel worth? Anſ. ol. 1s. $10\frac{1}{4}\frac{4}{8}\frac{1}{3}$d.

41. If 15 men can perform a piece of work in 22 days; how many men will finiſh another piece of work 4 times as large in a fifth part of the time?

Anſ. 300.

42. What ſum can I ſpend daily, out of an income of 1500l. per annum, to lay up 400 guineas at the year's end? Anſ. 2l. 19s. $2\frac{2}{7}\frac{2}{3}$d.

43. A gentleman ſpent, in one year, 364l. 12s. $4\frac{1}{4}$d. and had 50 guineas, 7 moidores, and 1l. 8s. $7\frac{1}{4}$d. left; how much did he ſpend one day with another, and what was his whole income?

Anſ. 19s. $11\frac{1}{4}$d. a day. 428l. a year.

44. How much in length, that is, $31\frac{1}{2}$ poles in breadth, will be equal to an acre?

Anſ. 11 ps. $14\frac{1}{11}$ feet.

45. A man's wages are 1l. 19s. 6d. for a month of 30 days; how much can he demand from the 10th of May, till the 27th of October inclusive?

Anſ. 11l. 3s. 10d.

46. At a noble a week; how many month's board can I have for 100l.? Anſ. 75 months.

47. Bought 15 pockets of hops, each weighing 2 cwts. 1 qr. 18 lbs.; what did they all coſt me, at 5l. 17s. 8d. per cwt.? Anſ. 212l. 14s. $10\frac{3}{4}\frac{5}{8}$d.

48. What muſt 40s. pay towards a tax, when 750l. 11s. 8d. is aſſeſſed at 90l. 11s. 9d.?

Anſ. 0l. 4s. $9\frac{3}{4}\frac{6}{8}\frac{5}{0}\frac{1}{0}\frac{9}{0}$d.

49. A tradeſman failing, owed to ſeveral perſons 1175l. 17s. 8d. but compounds with them for 11s. $6\frac{1}{2}$d. per pound; what muſt he pay them in all?

Anſ. 678l. 11s. $7\frac{1}{4}\frac{1}{1}\frac{1}{0}$d.

50. A gentleman allowed himſelf 5 quarts of wine every week, when it coſt 7s per gallon; what quantity may he drink every week, when it is 8s. a gallon, without increaſing the expence? Anſ. $4\frac{1}{4}$ quarts.

51. Bought 6 bales of cloth, each containing 9 pieces, and each piece 36 yards, at 18l. 12s. 6d. per piece; what is the value of the whole, and the rate per yard?

Anſ. the whole value 1005l. 15s. 0d. value per yard 0l. 10s. $4\frac{1}{6}$d.

52. A ſtaff 3 feet in length, perpendicularly erected, caſt a ſhadow to the diſtance of 5 feet 7 ins.; how high is that ſteeple, which, at the ſame time, caſt a ſhadow to the diſtance of 124 yards, 1 ft. 9 ins.?

Anſ. 66 yds. $2\frac{1}{6}\frac{1}{7}$ ft.

53. If ſound move at the rate of 1150 feet in one ſecond of time; in what time will it paſs through the ſpace of 12 miles, 1 fg. 183 yds.? Anſ. $56\frac{1}{1}\frac{6}{1}\frac{9}{5}\frac{9}{0}$ ſecs.

REMARK.

When you can uſe any of the following methods, the operations will be greatly ſhortened by ſo doing.

1ſt. Divide

1ſt. Divide the ſecond term by the firſt, and multiply the quotient into the third, and the product will be the anſwer.

2d. Divide the third term by the firſt, and multiply the quotient into the ſecond, and the product will be the anſwer.

3d. Divide the firſt term by the ſecond, and the third by that quotient, and the laſt quotient will be the anſwer.

4th. Divide the firſt term by the third, and divide the ſecond by the quotient, and the laſt quotient will be the anſwer.

It will ſometimes be difficult to ſeparate the parts of a queſtion, when two ſtatings are required; alſo to prepare a queſtion for ſtating; and ſometimes after a proportion is wrought; but no general rule can be given for the management of theſe caſes.

THE DOUBLE RULE OF THREE.

THE double rule of three, or *rule of five*, teacheth to anſwer ſuch queſtions in the ſingle rule of three, as require two proportions, by one ſtating; or, by five numbers or quantities given, to find a ſixth either in direct proportion or inverted.

RULE for STATING.

Place that number or quantity which is of the ſame kind with the required number in the middle, with proportional marks before and after it, as directed in the ſingle rule of three, and complete the ſtating with the more convenient two of the other four terms, that are of one name, by the ſame rule. Then, under the firſt and third terms, write the other two remaining terms as directed in the above named rule; that is, if the proportion require more let the third term be the greater; but if it require leſs let the firſt term be the greater, as you would obſerve to do in the firſt part of the ſtating.

METHOD of OPERATION.

Reduce the middle term into the loweſt name mentioned, the firſt and third terms both into one name, and the terms that ſtand under ther firſt and third terms into one name alſo. Then, multiply the firſt term by the term that ſtands under it for a diviſor, and the other three terms for a dividend; the quotient will be the anſwer in the ſame name you left your ſecond term in.

PROOF.

The method of proof is by two ſtatings in the ſingle rule of three.

EXAMPLES.

1. If 8 men can earn 6l. 8s. in 4 days; what ſum will 48 men earn in 16 days?

men	£.	s.	men
As 8	: 6	8	:: 48
4	20		16
32	128		288
			48
			768
			128
			6144
			1536
			768
			2,0
			32)98304(307,2
			96
			153l. 12s. Anſ.
			230
			224
			64
			64

As

men	£.	s.	men
As 8	: 6	8	:: 48
	29		
	128		
	48		
	1024		
	512		
	8)6144		
	2,0)768		
	£. 38	8	

days	£.	s.	days
As 4	: 38	8	:: 16
	20		
	768		
	16		
	4608		
	768		
	4)12288		
	2,0)307,2		
	£. 153	12	Proof

2. How many bushels of wheat will serve 72 people 8 days, when 4 bushels served 6 people 24 days?
Anſ. 16 bushels.

3. If 28lbs. of bread be sufficient for 7 men 7 days; how much bread will serve 42 people 6 days?
Anſ. 144lbs.

4. The carriage of 11½cwts. 150 miles cost 5l. 10s. 6d.; what must be paid for the carriage of 8 cwts. 70 miles, at the same rate? Anſ. 1l. 15s. 10¼d. $\frac{10}{11}$f.

5. What is the interest of 680l. for 7½ years at 2½ per cent per annum? Anſ. 114l. 15s. 0d.

6. If a footman travels 150 miles in 5 days when the days are 12 hours long; in how many days of 10 hours each will he travel 500 miles? Anſ. 20 days.

7. If 70l. defray the expences of 8 men 12 weeks and 6 days; how long would 18 men be in spending 150l. at the same rate? Anſ. 12 ws. 1 d. 17$\frac{1}{7}$ hs.

8. If the price of 9 ounces of bread, when the corn is 6s. 6d. per bushel, be 4½d.; what must be paid for 3 lbs. 4 ozs. when the corn is 8s. 2d. per bushel?
Anſ. 2s. 8½d. $\frac{3}{4}$

9. The

9. The allowance of 180 ſeamen for 18 days was 4000 lbs. of beef; how many lbs. will ſerve 290 ſeamen for 45 days? Anſ. 16111$\frac{1}{9}$ lbs.

10. If 240l. in 9 months amount to 250l. 16s.; at what rate per cent. per annum is it lent?

Anſ. 6 per cent.

11. If 4 men can do 25$\frac{1}{2}$ rods of ditching in 19$\frac{1}{2}$ days; how many rods can be done by 36 men in 28 days? Anſ. 329$\frac{1}{2}$, $\frac{1}{13}$ rods.

PRACTICE.

PRACTICE teacheth certain expeditious methods of finding the values of different commodities, the price of one article being given; and it takes its name from its great uſe in buſineſs.

NOTE.

1ſt. Any queſtion in the ſingle rule of three, where the firſt term is one, may be performed by this rule; and it is done by taking aliquot or even parts as often as the queſtion requires.

2d. When a leſſer number divides a greater without a remainder it is ſaid to be an aliquot part thereof.

3d. When the given quantity does not exceed 150, the beſt rules for finding its worth are thoſe contained in multiplication of compound quantities.

PROOF.

The method of proof is by the ſingle rule of three.

TABLE

TABLE of PRACTICE.

The aliquot parts of a pound.	The aliquot parts of a shilling.	The aliquot parts of a ton.	The aliquot parts of a hundred-weight.
s. d.	s. d.	cwts.	qrs. lbs.
10 0 are ½	6 are ½	10 are ½	2 or 56 ½
6 8 ⅔	4 ⅓	5 ½	1 or 28 ¼
5 0 ¼	3 ¼	4 ⅖	16 ⅛
4 0 ⅕	2 ⅕	2½ ¼	14 are ⅛
3 4 ⅙	1½ are ⅛	2 ⅕	8 1/16
2 6 ⅛	1 ⅛	1 ⅛	7 3/32
2 0 1/10	½ ⅛	½ 1/10	¼ 1/32
1 8 1/12	¼ 1/16	¼ 1/20	⅛ 1/64
1 0 1/20	⅛ 1/32	⅛ 1/40	⅛ 1/128

CASE I.

When the price is less than a penny.

RULE.

Divide by the aliquot part or parts that it is of a penny, and then by 12 and 20 for the answer.

EX-

EXAMPLES.

1. Value 2134 yards of tape, at 3 farthings per yard.

			yd.	yds.
$\frac{1}{2}$	$\frac{1}{2}$	2134	As 1 : $\frac{3}{4}$: :	2134
$\frac{1}{4}$	$\frac{1}{2}$	1067		3
		533 $\frac{1}{2}$		4)6402
	12	1600 $\frac{1}{2}$		12)1600 $\frac{1}{2}$
	20	13.3 $4\frac{1}{2}$		20) 13.3 $4\frac{1}{2}$
		£. 6 13 $4\frac{1}{2}$ Anſ.		£. 6 13 $4\frac{1}{2}$ Proof

2. 4506 yards of gartering, at $\frac{1}{4}$ per yard.
Anſ. 4l. 13s. $10\frac{1}{2}$d.

3. 6912 lbs. of brimſtone, at $\frac{1}{2}$ per lb.
Anſ. 14l. 8s. od.

4. 1692 knives, at $\frac{3}{4}$ each. Anſ. 5l. 5s. 9d.

5. 1347 yards of tape, at $\frac{1}{2}$ per yard.
Anſ. 2l. 16s. $1\frac{1}{2}$d.

6. 4162 pots, at $\frac{3}{4}$ each. Anſ. 13l. 0s. $1\frac{1}{2}$d.

CASE II.

When the price is more than a penny but under a ſhilling.

RULE.

Take the aliquot part or parts that it is of a ſhilling, add them together, and divide by 20 for the anſwer.

EX-

EXAMPLES.

1. Find the value of 4187 yards of tape, at $1\frac{1}{4}$d. per yd.

d.				yd.	d.	yds.
1	$\frac{1}{12}$	4187		As 1	$1\frac{1}{4}$	4187
					4	5
$\frac{1}{4}$	$\frac{1}{4}$	348	11d.		5	4)20935
		87	$2\frac{1}{4}$			
	2,0	43,6	$1\frac{1}{4}$			12)5233$\frac{1}{4}$
		£. 21	16 $1\frac{1}{4}$ Anſ.			2,0)43,6 $1\frac{1}{4}$d.

Proof £. 21 16 $1\frac{1}{4}$

2. 3718 knives, at $1\frac{1}{2}$d. each. Anſ. 23l. 4s. 9d.
3. 6194 lbs. of treacle, at $1\frac{1}{4}$d. per lb. Anſ. 45l. 3s. $3\frac{1}{2}$d.
4. 9187 yards of ribband, at 2d. per yard. Anſ. 76l. 11s. 2d.
5. 6194 papers of pins, at $2\frac{1}{4}$d. each. Anſ. 58l. 1s. $4\frac{1}{2}$d.
6. 7121 ounces of tea, at $2\frac{1}{2}$d. per oz. Anſ. 74l. 3s. $6\frac{1}{2}$d.
7. 6187 ſtamps, at $2\frac{1}{4}$d. each. Anſ. 70l. 17s. $10\frac{1}{4}$d.
8. 2161 ounces of thread, at 3d. per oz. Anſ. 27l. 0s. 3d.
9. 1871 lbs. of lead, at $3\frac{1}{4}$d. per lb. Anſ. 25l. 6s. $8\frac{1}{4}$d.
10. 1081 pots of porter, at $3\frac{1}{2}$d. per pot. Anſ. 15l. 15s. $3\frac{1}{2}$d.
11. 6182 ounces of coffee, at $3\frac{1}{4}$d. per oz. Anſ. 96l. 11s. $10\frac{1}{2}$d.
12. 61212 yards of ribband, at 4d. per yd. Anſ. 1020l. 4s. 0d.
13. 21010 pen-knives, at $4\frac{1}{4}$d. each. Anſ. 372l. 1s. $0\frac{1}{2}$d.
14. 31217 lbs. of ſugar, at $4\frac{1}{2}$d. per lb. Anſ. 585l. 6s. $4\frac{1}{2}$d.

15. 18101 lbs. of treacle, at 4¼d. per lb.
Anſ. 358l. 4s. 11¼d.
16. 61814 table-knives, at 5d. each.
Anſ. 1287l. 15s. 10d.
17. 81218 yards of ribband, at 5¼d. per yard.
Anſ. 1776l. 12s. 10½d.
18. 19121 pairs of gloves, at 5½d. per pair.
Anſ. 438l. 3s. 9½d.
19. 21812 ink-ſtands, at 5¾ each.
Anſ. 522l. 11s. 7d.
20. 61812 flower pots, at 6¼d. each.
Anſ. 1609l. 13s. 9d.
21. 18101 hats, at 6½d. each. Anſ. 490l. 4s. 8½d.
22. 61012 lbs. of butter, at 7¼d. per lb.
Anſ. 1843l. 1s. 5d.
23. 18719 pairs of buckles, at 7¾d. per pair.
Anſ. 604l. 9s. 4¼d.
24. 19101 lbs. of ſoap, at 8¼d. per lb.
Anſ. 656l. 11s. 11¼d.
25. 61918 yards of flannel, at 8¾d. per yard.
Anſ. 2257l. 8s. 6½d
26. 4187 lbs. of ſugar, at 9¼d. per lb.
Anſ. 161l. 7s. 5¾d.
27. 6191 pairs of gloves, at 9¾d. per pair.
Anſ. 251l. 10s. 2¼d.
28. 18191 ſnuff-boxes, at 10d. each.
Anſ. 757l. 19s. 2d.
29. 16187 turkeys, at 10¼d. each.
Anſ. 691l. 6s. 4¾d.
30. 4918 lbs. of hops, at 10¾d. per lb.
Anſ. 220l. 5s. 8½d.
31. 18141 yards of linen, at 11d. per yard.
Anſ. 831l. 9s. 3d.
32. 87121 lbs. of butter, at 11¼d. per lb.
Anſ. 4083l. 15s. 11¼d.
33. 69181 yards of cloth, at 11½d. per yard.
Anſ. 3314l. 18s. 5½d.
34. 62181 pairs of ſhoes, at 11¾d. per pair.
Anſ. 3044l. 5s. 6¾d.

CASE

CASE III.

When the price is above one ſhilling, and under two ſhillings.

RULE.

Take the aliquot part or parts for ſo much of the price as it is more than a ſhilling, which add to the given quantity, and divide by 20 for the anſwer.

EXAMPLES.

1. Find the value of 41821 yds. of ribband, at 1s. $0\frac{1}{4}$d. per yard.

			yd.	*s.* *d.*	*yds.*
$\frac{1}{4}$	$\frac{1}{4\frac{1}{2}}$	41821	As 1	: 1 $0\frac{1}{4}$	:: 41821
		871 $3\frac{1}{4}$d.		12	49
	2,0	4269,2 $3\frac{1}{4}$		12	376389
				4	167284
		£. 2134 12 $3\frac{1}{4}$ Anſ.		49	4)2049229
					12)5123071$\frac{1}{4}$
					2,0)4269,2 $3\frac{1}{4}$d.
					Proof £. 2134 12 $3\frac{1}{4}$

2. 12187 lbs. of ſugar, at 1s. $0\frac{1}{2}$d. per lb.
Anſ. 634l. 14s. $9\frac{1}{2}$d.
3. 69181 pairs of buckles, at 1s. $0\frac{1}{4}$d. per pair.
Anſ. 3675l. 4s. $9\frac{1}{4}$d.
4. 87682 days wages, at 1s. $1\frac{1}{4}$d. each.
Anſ. 4840l. 15s. $6\frac{1}{2}$d.
5. 21812 ſtones of cheeſe, at 1s. $2\frac{1}{4}$d. per ſtone.
Anſ. 1295l. 1s. 9d.
6. 41872 lbs. of coffee, at 1s. $2\frac{1}{2}$d. per lb.
Anſ. 2573l. 7s. 8d.
7. 87114 acres of land, at 1s. $3\frac{1}{2}$d. per acre.
Anſ. 5626l. 2s. 3d.
8. 21818 pairs of ſhoes, at 1s. $4\frac{1}{4}$d. per pair.
Anſ. 1522l. 14s. $3\frac{1}{2}$d.

9. 87124 yards of linen, at 1s. 5¼d. per yard.
Anſ. 6552l. 15s. 10d.

10. 14182 lbs. of ſugar, at 1s. 6¼d. per lb.
Anſ. 1078l. 8s. 5½d.

11. 21814 days works, at 1s. 7¾d. per day.
Anſ. 1795l. 2s. 2½d.

12. 41812 pairs of buckles, at 1s. 8¼d. per pair.
Anſ. 3527l. 17s. 9d.

13. 41916 watch-chains, at 1s. 9½d each.
Anſ. 3798l. 12s. 9d.

14. 21814 raſors, at 1s. 10½d. each.
Anſ. 2045l. 1s. 3d.

15. 18714 hats, at 1s. 11¼d. each.
Anſ. 1812l. 18s. 4½d.

16. 61871 pairs of gloves, at 1s. 11¾d. per pair.
Anſ. 6122l. 13s. 0¼d.

CASE IV.

When the price is any even number of ſhillings, under 20.

RULE.

Multiply the given quantity by half the price, double the firſt figure of the product for ſhillings, and the reſt of the product will be pounds.

EXAMPLES.

1. Find the value of 8718 yards of cloth, at 2s. per yard.

		yd.	*s.*	*yds.*
8718	As	1	: 2 ::	8718
1				2
£. 871 16 Anſ.				2,0)1743,6
				£. 871 16 Proof.

2.

2. 18721 lbs. of tea, at 4s. od. per lb.
Anſ. 3744l. 4s. od.
3. 61814 pairs of ſhoes, at 6s. od. per pair.
Anſ. 18544l. 4s. od.
4. 21812 new hats, at 8s. od. each.
Anſ. 8724l. 16s. od.
5. 18191 lambs, at 10s. od. each.
Anſ. 9095l. 10s. od.
6. 91814 yards of cloth, at 12s. od. per yard.
Anſ. 55088l. 8s. od.
7. 21814 ſtones of wool, at 14s. od. per ſtone.
Anſ. 15269l. 16s. od.
8. 18718 firkins of butter, at 16s. od. per firkin
Anſ. 14974l. 8s. od.
9. 17121 pairs of boots, at 18s. od. per pair.
Anſ. 15408l. 18s. od.

CASE V.

When the price is any odd number of ſhillings under 20.

RULE.

Multiply the given quantity by the price, and divide by 20 for the anſwer.

EXAMPLES.

1. Find the worth of 71872 yards of cloth, at 3s. per yard.

71872	*yd.* *s.* *yds.* As 1 : 3 :: 71872	
3		3
20)21561,6		20)21561,6
£. 10780 16 Anſ.		£. 10780 16 Proof.

2. 13245 hats, at 5s. od. each.
Anſ 5811l. 5s. od.
3. 10187 pairs of ſhoes, at 7s. od. per pair.
Anſ. 3565l. 9s. od.

4. 11218 loads of coals, at 9s. per load.
Anſ 5048l. 2s. 0d.

5. 10118 days works, at 11s. 0d. each.
Anſ. 5564l. 18s. 0d.

6. 17182 yards of cloth, at 13s. 0d per yd.
Anſ. 11168l. 6s. 0d.

7. 4121 ſtones of wool, at 15s. 0d per ſt
Anſ. 3090l. 15s. 0d.

8. 11218 lambs, at 17s. 0d. each
Anſ. 9535l. 6s. 0d.

9. 2121 pairs of boots, at 19s. 0d. per pr.
Anſ. 2014l. 19s. 0d.

C A S E VI.

When the price is ſhillings and pence, and they are aliquot part of a pound.

R U L E.

Divide by the aliquot part, and the quotient will be the anſwer.

E X A M P L E S.

1. Find the value of 3864 fleeces of wool, at 6s. 8d. each.

s.	d.			f.	s.	d.		fs.
6	8	1/3	3864	As 1	: 6	8	: :	3864
					12			80
		£.	1288 Anſ.		80			12)309120
								2,0)25760
								£. 1288 Proof.

2. 4132 pairs of ſtockings, at 3s. 4d. per pair.
Anſ. 688l. 13s. 4d.

3.

3. 8724 days works, at 2s. 6d. each.
Anſ. 1090l. 10s. 0d.

4. 6718 geeſe, at 1s. 8d. each. Anſ. 559l. 16s. 8d.

CASE VII.

When the price is ſhillings and pence, or ſhillings, pence and farthings, and they not an aliquot part of a pound.

RULE.

Multiply the given quantity by the ſhillings, and take parts for the pence and farthings, as in Caſe 2d; then add them together, and divide the ſum by 20 for the anſwer.

EXAMPLES.

1. Find the worth of 3718 yards of cloth, at 9s. 6½d. per yard.

d.			yd. s.	d.	yds.
6	½	3718	As 1 : 9	6½ ::	3718
		9	12		458
		33462	1.14		29744
½	3/12	1859	4		18590
		154 12			14872
			458		
	2,0	3547.5 11			4)1702844
		£. 1773 15 11 Anſ.			12)425711
					2,0)3547.5 11
					£. 1773 15 11 proof

2. 4183 lbs. of tea, at 8s. 5¼d. per lb.
Anſ. 1773l. 8s. 4¼d.

3. 8346 cwts. of lead, at 11s. 7¼d. per cwt.
Anſ. 4842l. 8s. 4½d.

4. 1218 pigs, at 14s. 9½d. each. Anſ. 900l. 16s. 3d.

5.

5. 1712 days wages, at 16s. 11½d. each.
Anſ. 1449l. 17s. 0d.
6. 2181 firkins of butter, at 17s. 0½d. per firkin.
Anſ. 1860l. 13s. 3½d.
7. 1014 ſugar loaves, at 12s. 6½d. each.
Anſ. 634l. 16s. 1½d.
8. 9764 pairs of boots, at 19s. 11½d. per pair.
Anſ. 9753l. 16s. 7d.

CASE VIII.

When the price is pounds only.

RULE.

Multiply the quantity by the price, and the product will be the anſwer.

EXAMPLES.

1. Find the worth of 6181 horſes, at 7l. each.

hs.	*h. £. hs.*
6181	As 1 : 7 :: 6181
7	7
£. 43267 Anſ.	£. 43267 Proof.

2. 3579 horſes, at 9l. each. Anſ. 32211l.
3. 1234cwts. of hops, at 13l. per cwt. Anſ. 16042l.
4. 6174 barrels of pot-aſhes, at 14l. per bl.
Anſ. 86436l.
5. 1218 cows, at 17l. each. Anſ. 20706l.
6. 7181 years wages, at 21l. per year.
Anſ. 150801l.

CASE IX.

When the price is pounds and ſhillings.

RULE.

Multiply the quantity given by the pounds; and then, if the ſhillings are even, proceed with them by Caſe 4th; but,

but, if they are uneven, take aliquot parts for them. Add up the lines, and the ſum will be the anſwer.

EXAMPLES.

1. Value 2187 cows, at 8l. 6s. and at 9l. 15s. each.

cs.		l.	s.	cows.
2187	As 1 : 8	6	: :	2187
8		20		166
17496		166		13122
656 2				13122
				2187

£. 18152 2 Anſ. at 8l. 6s. each.

2,0)36304,2

£. 18152 2 proof at do.

s.			l.	s.	cows.
10	½	2187	As 1 : 9	15	: : 2187
		9		20	195
		19683		195	10935
5	½	1093 10			19683
		546 15			2187

21323 5 Anſ. at 9l. 15s each 2,0)42646,5

£. 21323 5 Pr. at do.

2. 3718 loads of corn, at 7l. 12s. per ld.
Anſ. 28256l. 16s. od.

3. 1294 firkins of ſoap, at 9l. 13s. per fn.
Anſ. 12487l. 2s. od.

4. 6131 caſks of rum, at 8l. 16s. per ck.
Anſ. 53952l. 16s. od.

5.

5. 4647 bags of hops, at 11l. 17s. per bg.
Anſ. 55066l. 19s. od.

6. 8761 horſes, at 4l. 18s. each.
Anſ. 42928l. 18s. od.

7. 2146 cwts. of ſugar, at 3l. 9s. per cwt.
Anſ. 7403l. 14s. od.

8. 1394 caſks of prunes, at 5l. 14s. per ck.
Anſ. 7945l. 16s. od.

9. 4161 hhds. of porter, at 7l. 19s. per hhd.
Anſ. 33079l. 19s. od.

CASE X.

When the price is pounds, ſhillings and pence, and the ſhillings and pence are an aliquot part of a pound.

RULE.

Multiply the given quantity by the pounds, and work as in Caſe 6th, for the ſhillings and pence; add them together, and the ſum will be the anſwer.

EXAMPLES.

1. Value 6184 bags of hops, at 5l. 6s. 8d. per bag.

s.	*d.*				*b.*	*£.*	*s.*	*d.*	*bags.*
6	8	½	6184		As 1 :	5	6	8 ::	6184
			5			20			1280
			30920			106			49472
			2061	6 8		12			12368
			32981	6 8 Anſ.		1280			6184
									12)7915520
									2,0)65962,6 8
									£. 32981 6 8 Pr.

2.

2. 5618 cwts. of ſugar, at 3l. 3s. 4d. per cwt.
Anſ. 17790l. 6s. 8d.

3. 1209 horſes, at 7l. 2s. 6d. each.
Anſ. 8614l. 2s. 6d.

4. 7126 butts of beer, at 5l. 1s. 8d. per bt.
Anſ. 36223l. 16s. 8d.

CASE XI.

When the price is pounds, ſhillings and pence; or pounds, ſhillings, pence and farthings; and the ſhillings and pence are not an aliquot part of a pound.

RULE.

Reduce the pounds and ſhillings into ſhillings; multiply the given quantity by the ſhillings; take aliquot parts for the pence, or pence and farthings; then add all the lines together, and divide the ſum by 20 for the anſwer.

EXAMPLES.

1. Value 3296 hhds. of beer, at 3l. 17s. 9½d. per hhd.

d.				bhd.	£.	s.	d	bhds.
6	½	3296		As 1 :	3	17	9½ : :	3296
		77			20			3734
		23072			77			13184
		23072			12			9888
		253792			933			23072
3	½	1648			4			9888
½	⅛	824					4)12307264	
		137	4		3734			
							12)3076816	
2,0		25640,1	4					
							2,0)25640,1	4
		128201	4 Anſ.				£.	128201 4 Proof

2.

2. 2138 acres of corn at 2l. 15s. 4¼d. per a.
Anſ. 5917l. 7s. 2½d.

3. 1274 bags of hops, at 4l. 18s. 6¼d. per b.
Anſ. 6275l. 15s. 6½d.

4. 7181 dozens of claret, at 2l. 7s. 7¼d. per d.
Anſ. 17092l. 5s. 6¼d.

5. 1218 hhds. of ale, at 5l. 11s. 9½d. per hhd.
Anſ. 6808l. 2s. 3d.

6. 8718 horſes, at 6l. 15s. 10½d. each.
Anſ. 59227l. 18s. 3d.

7. 1214 bales of cloth, at 7l. 18s. 11¼d. per b.
Anſ. 9650l. 0s. 8½d.

CASE XII.

When both the price and quantity are of ſeveral denominations.

RULE.

Multiply the price by the quantity, taking aliquot parts for qrs. lbs. &c. then add them together, and the ſum will be the anſwer.

EX.

EXAMPLES.

1. Find the value of 18 cwts. 2 qrs. 14 lbs. of hops, at 3l. 7s. 6d. per.

qrs.	lbs.		£.	s.	d.
2	0	½	3	7	6
					9
			30	7	6
					2
			60	15	0
0	14	¼	1	13	9
			0	8	5¼
			62	17	2¼ Anſ.

cwts.	£.	s.	d.
As 1 :	3	7	6 ::
4	20		
4	67		
28	12		
112	810		

cwt.	qrs.	lbs.
18	2	14
4		
74		
28		
596		
149		
2086		
810		

2086
16688 (12)

112)1689660(15086
112
2,0)125,7 2¼
569
560 £. 62 17 2¼
Proof
966
896
700
672
28
4
112)112(¼
112
...

2. Value 17 cwts. 3 qrs. 24 lbs. of ſugar, at 2l. 9s. 7d. per cwt. Anſ. 44l. 10s. 8¼d.

3. Value 22 cwts. 2 qrs. 18 lbs. of hops, at 3l. 13s. 8d. per cwt. Anſ. 83l. 9s. 4d.

4. Value 24 lbs. of double refined ſugar, at 4l. 14s. 6d. per cwt. Anſ. 1l. 0s. 3d.

5. Value 87 lbs. of tea, at 8l. 11s. 8d. per cwt. Anſ. 6l. 13s. 4d.

6. Value 13 cwts. 3 qrs. 27 lbs. of tobacco, at 4l. 11s. 8d. per cwt. Anſ. 64l. 2s. 5¼d.

7. Value 37 cwts. 0 qrs. 10 lbs. of coffee, at 11l. 17s. 10d. per cwt. Anſ. 441l. 1s. 0½d.

8. Value 108 lbs. of butter, at 3l. 13s. 6d. per cwt. Anſ. 3l. 10s. 10½d.

9. Value 37 as. 3 rs. 38 ps. of land, at 1l. 17s. 8d. per a. Anſ. 71l. 10s. 10½d.

10. Value 51 ozs. 11 dwts. 19 grs. of gold, at 3l. 13s. 8d. per oz. Anſ. 190l. 0s. 4¼d.

TARE and TRETT.

TARE and trett teacheth the rules or methods that are uſed to deduct ſuch allowances, as merchants and tradeſmen uſually make in ſelling goods by weight.

OBSERVE.

The *groſs weight* is the whole weight of the goods and the package that contains them, whether caſk, cheſt, hamper, or whatever elſe.

The *tare* is the weight of the package, or an allowance made inſtead thereof.

The *trett* is an allowance of 4 lbs. in every 104 lbs. for waſte, duſt, &c.

The *cloff* is an allowance of 2 lbs. in every 3 cwts. to make the weight hold good when ſold by retail.

The *ſuttle* is when part of the allowance is deducted from the groſs weight.

The *neat or net weight* is what remains when all the allowances are deducted from the groſs weight.

CASE

CASE I.

When the tare is at ſo much in the whole groſs weight.

RULE.

Subtract the tare from the groſs, and the remainder is the neat weight.

EXAMPLES.

1. The groſs weight is 124 cwts. 1 qr. 18 lbs. and the tare is 13 cwts. 2 qrs. 19 lbs.; what is the neat weight?

cwts.	*qrs.*	*lbs.*	
124	1	18	groſs weight
13	2	19	tare
Anſ. 110	2	27	neat weight

2. What is the neat weight of 23 hhds. of tobacco, each weighing 15 cwts. 1 qr. 21 lbs. groſs, tare in the whole 18 cwts. 2 qrs. 11 lbs.?

Anſ. 336 cwts. 1 qr. 24 lbs.

3. The groſs weight is 15 cwt. 3 qrs. 15 lbs. and the tare is 3 cwts. 18 lbs.; what is the neat weight?

Anſ. 12 cwt. 2 qrs. 25 lbs.

4. One caſk weighs 6 cwts. 17 lbs. groſs, another weighs 11¼ cwts. groſs, a third weighs 5 cwts. 1 qr. 19 lbs. groſs, and a fourth weighs 12 cwts. 2 qrs. 27 lbs. groſs; the tare of the whole is 3 cwts. 1 qr. 19 lbs.; what is the neat weight? Anſ. 32 cwts. 16 lbs.

CASE II.

When the tare is at ſo much per box, barrel, or bag, &c.

RULE.

Multiply the tare of each box, barrel, &c. by the number of boxes, barrels, &c. Then ſubtract the pro-

duct from the groſs, and the remainder will be the neat weight.

EXAMPLES.

1. In 9 bags of hops, each weighing 6 cwts. 1 qr. 18 lbs. groſs, and tare 29 lbs. per bag; how much neat weight?

cwts.	*qrs.*	*lbs.*		*cwts.*	*qr.*	*lb.*	*lbs.*
6	1	18		0	1	1=29	
		9				9	
57	2	22	groſs weight	2	1	9	tare
2	1	9	tare				
Anſ. 55	1	13	neat weight				

2. What is the neat weight of 32 bales of ſilk, each weighing 3 cwts. 18 lbs. groſs, tare at 21 lbs. per bale? Anſ. 95 cwts. 16 lbs.

3. Required the neat weight of 9 barrels of oil, weighing groſs 21 cwts. 1 qr. 19 lbs.; tare, per barrel, 1 qr. 13 lbs.? Anſ. 18 cwts. 14 lbs.

4. In 17 hhds. of tobacco, each 2 cwts. 1 qr. 12 lbs. groſs, tare 39 lbs. per hhd.; how much neat weight? Anſ. 34 cwts. 17 lbs.

5. What is the neat weight of 26 bags of cotton yarn, each weighing 2 cwts. 2 qrs 5 lbs. groſs, tare 13 lbs. per bag? Anſ. 63 cwts. 16 lbs.

CASE III.

When the tare is at ſo much per cwt.

RULE.

Divide the groſs weight by the aliquot part or parts that the tare is of a cwt. and the quotient ſubtracted from the groſs leaves the neat weight.

EX-

EXAMPLES.

1. What is the neat weight of 19 hhds. of sugar, each weighing 2 cwts. 1 qr. 11 lbs. gross, tare at 21 lbs. per cwt.?

cwts.	qr.	lbs.	ozs.
2	1	11	0
			6
14	0	10	0
			3
42	1	2	0
2	1	11	0

lbs.						
14	$\frac{1}{8}$	44	2	13	0	gross weight.
7	$\frac{1}{2}$	5	2	8	10	
		2	3	4	5	
		8	1	12	15	tare.
		Anſ. 36	1	0	1	neat weight.

2. In 8 hhds. each 4 cwts. 2 qrs. 18 lbs. gross, and 10 lbs. per cwt. tare; how much neat weight?

Anſ. 33 cwts. 3 qrs. 23 lbs. $2\frac{1}{2}$ ozs.

3. What is the neat weight of 11 barrels of potaſhes, each weighing 187 lbs. gross, the tare being $11\frac{1}{2}$ lbs. per cwt. Anſ. 1845 lbs. $14\frac{1}{2}$ ozs.

4. Required the value of the neat weight of 17 hhds. of tobacco, at 3l. 18s. 4d. per cwt. each hhd. weighing 12 cwts. 1 qr. 11 lbs. gross, the tare being 19 lbs. per cwt.? Anſ. 682l. 13s. $9\frac{1}{2}$ $\frac{1}{4}$d.

5. What is the neat weight of 9 barrels of indigo, each 3 cwts. 1 qr. 16 lbs. gross, tare $9\frac{1}{2}$ lbs. per cwt.?

Anſ. 27 cwts. 1 qr. 21 lbs. 2 ozs.

6. In 26 barrels of figs, each 4 cwts. 19 lbs. gross, tare $16\frac{1}{2}$ lbs. per cwt.; how much neat weight?

Anſ. 91 cwts. 2 qrs. 6 lbs. 14 ozs.

CASE IV.

When both tare and trett are allowed.

RULE.

Find the tare as before, ſubtract it from the groſs, and call the remainder the ſuttle. Then, divide the ſuttle by 26, and the quotient will be the trett, which deduct from the ſuttle, and the remainder will be the neat weight.

EXAMPLES.

1. In 18 cwts. 2 qrs. 11 lbs. groſs, tare 15 lbs. per cwt. and trett 4 lbs. per 104 lbs.; how much neat weight?

lbs.		*cwts.*	*qrs.*	*lbs.*	*ozs.*	
14	$\frac{1}{8}$	18	2	11	0	groſs weight
1	$\frac{1}{14}$	2	1	8	6	
		0	0	18	9	
		2	1	26	15	tare
	26	16	0	12	1	ſuttle
		0	2	13	6	trett
		Anſ. 15	3	26	11	neat weight.

2. In 14 cwts. 3 qrs. 27 lbs. groſs, tare 41 lbs. and trett 4 lbs. per 104 lbs.; how much neat weight?

Anſ. 14 cwts. 7 lbs.

3. In 54 bags of hops, each weighing groſs 6 cwts. 1 qr. 9 lbs. tare $17\frac{1}{4}$ lbs. per 112 lbs. and trett as uſual; how much neat weight? Anſ. 175 cwts. 9 lbs. 1 oz.

4. Suppoſe $13\frac{1}{2}$ lbs. per cwt. tare, and 4 lbs. per 104 lbs. trett, were allowed on 9 caſks of prunes, each 2 cwts. 17 lbs. groſs; what would be the neat weight?

Anſ. 16 cwts. 1 qr. 9 lbs. 12 ozs.

5. How much neat weight is there in 9 caſks of raiſins, weighing in all 148 cwts. 1 qr. 19 lbs. groſs, the tare being 17 cwts. 21 lbs. and the trett 4 lbs. per 104 lbs.? Anſ. 126 cwts. 20 lbs. 12 ozs.

CASE

CASE V.

When tare, trett, and cloff are allowed.

RULE.

Deduct the tare and trett by the foregoing rules, and divide the remainder by 168 for the cloff. The difference between the cloff and the remainder is the neat weight.

EXAMPLES.

1. In 13 chefts of fugar, each containing 11 cwts. 1 qr. 17 lbs. groſs, tare 11 lbs. per cwt. trett 4 lbs. per 104 lbs. and cloff 2 lbs. in every 3 cwts.; how much neat weight.

		cwts.	*qrs.*	*lbs.*	*ozs.*	
		11	1	17	0	
					12	
		136	3	8	0	
		11	1	17	0	
lbs.						
8	$\frac{1}{14}$	148	0	25	0	groſs weight
2	$\frac{1}{4}$	10	2	9	12	
1	$\frac{1}{2}$	2	2	16	7	
		1	1	8	3	
		14	2	6	6	tare
	26	133	2	18	10	ſuttle
		5	0	15	12	trett
	168	128	2	2	14	ſuttle
		0	3	1	10	cloff
	Anſ.	127	3	1	4	neat weight

2. What

2. What is the neat weight of 41 cwts. 1 qr. 11 lbs. groſs, allowing 5 cwts. 1 qr. 27 lbs. for tare and trett, and cloff as uſual?

Anſ. 34 cwts. 1 qr. 2 lbs. 10 ozs.

3. I demand the neat weight of 18 cheſts of ſugar, each containing 7 cwts. 18 lbs. groſs, tare 17$\frac{4}{4}$ lbs. per cwt. trett 4 lbs. per 104 lbs. and cloff 2 lbs. per 3 cwts.?

Anſ. 105 cwts. 24 lbs 7 ozs.

4 What is the value of the neat weight of 17 parcels, each weighing 2 cwts. 3 qrs. 9 lbs. groſs, allowing 6$\frac{1}{8}$ lbs. per cwt. tare, and trett and cloff as uſual, at 1l. 6s. 8d. per cwt. neat?

Anſ. 576l. 18s. 11$\frac{3}{4}$ $\frac{29}{32}$d.

5. In 9 jars of oil, each weighing 4 cwts. 1 qr. 11 lbs. groſs; how many neat gallons, allowing 19 lbs. per cwt. tare, trett and cloff as uſual, and 7$\frac{1}{2}$ lbs. to the gallon?

Anſ. 463$\frac{5}{60}$ galls.

6. In 60 jars of oil, each containing 1345 cubic inches, tare 1 lb in 12 lbs. trett and cloff as uſual, and 7$\frac{1}{2}$ lbs. to the gallon of 231 cubic inches; what is the worth of the whole at 1l. 5s. 9d. per cwt.?

Anſ. 26l. 7s. 9$\frac{3}{4}$ $\frac{3}{112}$d.

BILLS of PARCELS.

A Bill of parcels is a written account which the merchant or ſeller delivers or ſends to the purchaſer, containing the place where, and the time when, the goods were bought, the names of the buyer and ſeller, the quantity, quality and price of the goods bought, the marks and numbers put upon the parcels, cheſts, or hogſheads in which they are contained, the allowances that are made, the total value, &c.

RULE.

In the firſt line write the place where, and the time when, the goods were bought, in the ſecond the name of the buyer, and in the third the name of the ſeller, in the ſame form as they are done in the following examples.

Then,

Then, let each article have one or more lines as may be neceſſary to mention its quantity, quality, allowances, price, and amount. This being done as plainly and diſtinctly as poſſible, then write under the amount the total value of all the goods ſold, which completes the bill of parcels.

EXAMPLES.

(1) *Denton, 11th Aug.* 1790.

Mr Joſeph Dixon,

Bought of John Weddell,

		£.	s.	d.		£.	s.	d.
12 yds. of fine black cloth,	at	0	11	6	pr yd.	6	18	0
15 yds. of corduroy,	at	0	3	8	——	2	15	0
11 yds. of ſhalloon,	at	0	2	1	——	1	2	11
5 yds. of ſuperfine drab cloth,	at	1	1	4	——	5	6	8
8 yds. of ſuperfine ſcarlet,	at	1	4	7	——	9	16	8
16 yds. of thickſet,	at	0	6	3	——	5	0	0
					£.	30	19	3

NOTE.

If Joſeph Dixon pays John Weddell ready money for the above-mentioned goods, the receipt, at the foot of the bill, will be as follows:

Received, at the ſame time, the contents in full,
John Weddell.

If Joſeph Dixon pays William Rutter, his ſhopman, the money, his receipt will be;

Received, at the ſame time, the contents in full for my maſter John Weddell, *William Rutter.*

If he pays twenty pounds in part, the receipt will be;

Received, at the ſame time, twenty pounds in part of the above bill, *John Weddell.*

If he gives his note for the whole, on demand, the receipt will be;

Received, at the ſame time, a promiſſory note, on demand, in full for the above bill. *John Weddell.*

(2)

(2) *Denton, 11th Aug. 1790.*

Mr John Bell,

Bought of William Tone,

		£.	s.	d.	
14½ lbs. of bohea tea,	at	0	6	2	per lb.
11¼ lbs. of green tea	at	0	8	9	——
1¼ cwts. of tobacco,	at	3	11	6	per cwt.
67¼ lbs. of ſugar,	at	0	1	1¼	per lb.
11½ barrels of raiſins,	at	3	1	9	per bl.
8¼ lbs. of coffee,	at	0	2	7¼	per lb.
9½ lbs. of pepper,	at	0	3	8	——

£. 55 ~~18 1~~ 17 ~~4~~ 4

(3) *Denton, 11th Aug. 1790.*

Mr Freeman Hilton,

Bought of George Brown,

		£.	s.	d.	
8 gallons of ſherry,	at	0	7	6	per gall.
11 gallons of claret,	at	0	13	8	——
13 gallons of fine old port	at	0	6	4	——
6 gallons of madeira,	at	0	17	2	——
21 gallons of vidonia,	at	0	8	1	——
5 gallons of canary,	at	0	14	4	——

£. 31 17 1

(4) *Denton, 11th Auguſt, 1790.*

Mr William Tone,

Bought of John Seymour,

		£.	s.	d.	
8½ quarters of barley,	at	1	2	4	per qr.
12 buſhels of wheat,	at	0	7	8	per bl.
9½ quarters of maſlin,	at	2	2	4	per qr.
15¼ quarters of oats,	at	1	1	1	——
24 buſhels of beans,	at	0	4	8	per bl.
3¼ quarters of peaſe,	at	0	17	9	per qr.
2¼ cwts. of hops,	at	4	11	8	per cwt.

£. 69 12 0

(5)

(5) *Denton, 11th Auguſt, 1790.*

Mr John Thompſon,

Bought of John Cairns,

	cwts qrs lbs	£. s. d.
11 Cheſhire cheeſes, weight	4 3 11 at	1 13 4 per cwt.
8 Gloſter cheeſes	3 1 18 at	2 1 8 ——
17 lbs. of cream cheeſe - -	at	0 1 4 per lb.
3 firkins of butter - - - -	at	1 10 8 per fn.
4 flitches of bacon, weight	3 1 11 at	2 11 8 per cwt.
18 Stilton cheeſes,	1 1 11 at	4 11 4 ——
7 Wiltſhire cheeſes,	2 2 17 at	1 14 3 ——
		£. 40 5 3½

6. On the 11th of Auguſt, 1790, John Dack went to Denton, and bought of Robert Dent the following goods, viz 8 pairs of worſted ſtockings, at 3s. 8d. per pair; 16 pairs of ſilk ſtockings, at 11s 10d. per pair; 11 pairs of cotton ſtockings, at 2s. 11d. per pair; 18 yards of corduroy, at 3s. 8½d. per yard; 13 pairs of men's gloves. at 1s. 7d. per pair; and 15 yards of flannel, at 1s. 7¼d. per yard.—He paid five pounds in part for the above goods, and gave a note for the reſt to be paid in one month.—Required a bill of parcels and receipt for the above tranſaction?

Denton, 11th Auguſt, 1790.

Mr John Dack,

Bought of Robert Dent,

	s. d.	£. s. d.
8 pairs of worſted ſtockings, at	3 8 per pr.	1 9 4
16 pairs of ſilk ſtockings, at	11 10 ——	9 9 4
11 pairs of cotton ſtockings, at	2 11 ——	1 12 1
18 yards of corduroy, at	3 8½ per yd.	3 7 1
13 pairs of men's gloves, at	1 7 per pr.	1 0 7
15 yards of flannel, at	1 7¼ per yd.	1 4 0¼
		£. 18 2 5¼

Re-

Received, at the same time, five pounds in cash, and Mr John Dack's promissory note for thirteen pounds two shillings and five-pence three farthings, to be paid one month after date, which, together, are in full of the above bill. *Robert Dent.*

7. John Weddell buys of John Wilson of Denton, August 11th, 1790, the following articles, for which he pays ready money, viz. 8 bunches of brocoli, at 2½d. per bunch; 3 bunches of carrots, at 1½d. each; 4 ropes of onions, at 3¼d. per rope; a bushel of potatoes at 7½d. per peck; 6 lbs. of grapes, at 1s. 4d. per lb.; 5 dozen of apricots, at 10¼d. per dozen; and 7 melons, at 1s. 1½d each. A bill of parcels and receipt for the above goods is demanded?

8. August 11th, 1790, Thomas Stubbs of Denton, sells Joseph Lee the following articles on trust, *viz.* A fore quarter of lamb, wt. 11½ lbs. at 5¼d. per lb.; a quarter of pork, wt. 16 lbs. at 5½d per lb.; a buttock of beef, wt. 49 lbs. at 3¼d. per lb.; a fillet of veal, weight 11¼ lbs. at 3¼d. per lb; a sirloin of beef, wt 28 lbs. at 4½d. per lb; a saddle of mutton, wt. 17¼ lbs. at 5¼d. per lb.; and 10 lbs. of beef steaks, at 5¼d. per lb.; required a bill of parcels of the above articles?

9. John Young of Denton, buys of Joseph Dixon of Hartlepool, August 11th, 1790, the following articles, viz. 6 lobsters, at 5½d. each; 9 lbs. of sturgeon, at 7½d. per lb.; 18½ lbs. of brawn, at 2s 1d. per lb; a large cod, price 5s 9d; 4 brace of carp, at 2s. 1d. per brace; and 4 quarts of oisters, at 1s. 2d. per quart. He pays in part 15s. 6d. and gets a month's credit for the remainder. A bill of parcels and receipt is demanded.

BOOK DEBTS.

A Book debt is an account of goods sold, or work done, at different times, by one person to or for another, and entered into a book kept by him called the

the ledger, at the time when the goods were sold or the work done, with the price and other circumstances as in a bill of parcels.

R U L E.

Write the year of our Lord; then the name of the buyer or employer, with the word *to* after it; after which put the name of the seller or workman, and Dr. or Debtor after it. Then, write each article with its proper date and other particulars, as recorded in the Ledger. When this is done, cast up the whole; and if any part of the bill has been paid, or any goods got by the person charged Dr. make a counter account on the other side of the paper, or at the bottom of the bill, prefacing it with *per contra Cr.* and expressing the particulars as before directed.

E X A M P L E S.

(1) *Mr George Brown to William Tone,* *Dr.*

1790.			*s.*	*d.*		£.	*s.*	*d.*
Jan.	10.	To 18½ lbs. of currants,	at 0	4½	per lb.	0	6	11¼
—	18.	— 29½ lbs. of raisins,	at 0	3½		0	9	1½
May	6.	— 11½ lbs. of rice,	at 0	2½		0	2	4¾
—	12.	— 41¼ lbs. of raisins of the sun,	at 0	4¼		0	14	9¼
June	1.	— 31 lbs. of loaf sugar,	at 1	1½		1	14	10½
—	18.	— 10 stones of soap,	at 7	2½	per ft.	3	11	10½
July	4.	— 18¾ lbs. of coffee,	at 2	7½	per lb.	2	7	10¼
						£. 9	7	10½

N O T E.

The same receipt which is annexed to a bill of parcels may be annexed to a book debt, the time when the money is paid being mentioned.

(2) *Mr John Weddell to George Wilson,* *Dr.*

1790.		£.	s.	d.	£.	s.	d.
May 6.	To 12½ yds. of blue ribbon, at	0	1	4 per yd.			
— 11.	— 11 French mounted fans, at	1	2	8 each			
— 13.	— 14 prs. of Roman gloves, at	0	2	9 per pr.			
June 8.	— 8 farſenet hoods, at	1	1	2 each			
— 12.	— 17 yds. of flowered ſilk, at	0	8	8 per yd.			
— 18.	— 21 yards of fine lace, at	0	14	1 ——			
July 4.	— 18 pairs of kid gloves, at	0	3	6 per pr.			
					£.	48	19 11

(3) *Mr William Rutter to Joſeph Todd,* *Dr.*

1790.		£.	s.	d.
Feb. 4.	To a new cart making —	0	14	6
— 12.	— 6 new chairs, at 9s. 6d. a piece	2	17	0
— —	— 2 elbow chairs, at 14s. 8d.	1	9	4
— 18.	— mending a book-caſe and a door	0	7	6
March 2.	— a dinner tray and tea board	1	4	6
— 11.	— Watſon jobbing 9 days —	0	18	0
— 18.	— 3 pairs of harrows making	0	11	8
May 6.	— 8 picture frames — —	1	6	8
— 21.	— a new bedſtead with doors	2	17	6
		£.	12	6 8
May 4.	By caſh, received on account	£.	7	7 0
	Balance due to me	£.	4	19 8

(4) *Mr*

(4) *Mr Joseph Dixon to Wm Cairns,* *Dr.*

1790.			£.	s.	d.
Jan.	10.	To 8 dozen of lemons, at 1s. 8¼d. per doz.			
——	11.	— 14 dozen of Lisbon ditto, at 2s. 1½d. per doz.			
——	14.	— 11½ hundred of oranges, at 6s. 3d. per hund.			
——	18.	— 14 ropes of onions, at 0s. 6¼d. per rope			
Feb.	4.	— 11 pecks of ditto, at 0s. 10½d. per peck.			
——	6.	— 20 dozen of China oranges, at 1s. 4¼d. per doz.			
——	19.	— 17 lbs. of grapes, at 2s. 2½d. per lb.			
March	7.	— 18 dozen of peaches, at 1s. 4d. per doz.			
——	9.	— 4 bushels of chesnuts, at 3s. 9½d. per bush.			
——	11.	— 8 pecks of pears at 1s. 8d. per peck			
——	18.	— 6¼ lbs. of grapes, at 2s. 1d. per lb.			
			Dr. 13	3	0¾

1790.	*Per Contra.*	*Cr.*		
Feb. 6.	By cash, received on account	0	7	6
March 8.	— 3 bushels of wheat, at 6s. 4d. per bush.	0	19	0
—— 9.	— Cash, received from John Wilson for you	0	5	0
—— 14.	— 4 bush. of bran, at 9½d. per bl.	0	3	2
		Cr. 1	14	8
	Balance due	£ 11	8	4¾

(5) *Mr John Ward to James Long, Dr.*

1790.		£.	s.	d.
Jan. 6.	To 18 lbs. of green tea, at ol. 8s. 6d. per lb.			
— 8.	— 21½ lbs. of bohea tea, at ol. 6s. 4d. per lb.			
— 18.	— 9 ſtones of ſoap, at ol. 8s. 2d. per ſtone			
— 21.	— Caſh, paid John Robſon by your order	10	10	0
Feb. 2.	— 11¼ lbs. of double refined ſugar at ol 1s. 8d. per lb.			
— 8.	— 6½ cwts. of treacle, at 1l. 8s. 6d. per cwt.			
— 12.	— 4½ cwts. of ſtarch, at 2l. 1s. 2d. per cwt.			
— 18.	— 30 lbs. of hair-powder, at ol. 1s. 1d. per lb.			
— 21.	— 6 bags of ſhot, weight in all, 18 cwts. at 1l. 1s. 2d. per cwt.			
— 26.	— 24 lbs. of battle gunpowder, at ol. 2s 1d. per lb.			
— 27.	— 4 bags of gun flints, at 1l. 1s. 3d. each			
— 28.	— 6 ſacks of flour, at 2l. 3s. 8d. per ſack			
		£. 88	12	5

Per Contra.

1790.		Cr. £.	s.	d.
Jan. 18.	By caſh received by your ſervant -	4	4	0
— 21.	— a pair of new boots for myſelf -	1	6	8
— 24.	— 8 hams, wt. 161¼ ft. at 3s. 8d. per ft.			
— 24.	— caſh, received by Miſs Ward -	5	10	6
— 28.	— 6 cwts. of cheeſe, at 1l. 11s. 4d. per cwt.			
Feb. 6.	— 3 firkins of butter, at 1l. 10s. 6d. per fn.			
— 8.	— a cow and a calf bought of you	10	5	0
— 21.	— a bag of hops, valued at	5	8	6
— 24.	— caſh, received by your ſervant -	2	10	6
— 28.	— abatement made for the gunpowder	0	5	0
— 28.	— caſh, to balance this account	42	3	2
		£. 88	12	5

6. Mr

6. Mr John Lee bought of William Watſon, as follows: 1790, Jan 6, a flank of beef, weight 18½ lbs. at 3¾d. per lb.—Jan 12, a loin of lamb, wt. 8½ lbs. at 5¼d. per lb.—Jan 18, a leg of mutton, wt. 17¼ lbs. at 3¾d. per lb.—Feb. 2, a buttock of beef, wt. 39 lbs. at 4d per lb.—Feb. 6, a ſhoulder of pork, wt 17¼ lbs. at 5½d. per lb.—Feb. 12, a loin of mutton, wt 7¼ lbs. at 3½d. per lb.—On the 17th of Feb. this bill was paid in full. You are deſired to put the above bill and receipt into a proper form.

Mr John Lee to William Watſon, *Dr.*

1790.		lbs.	d.	£.	s.	d.
Jan. 6.	To a flank of beef, wt.	18½	at 3¾ per lb.	0	5	9¾
—— 12.	—a loin of lamb, wt.	8½	at 5¼	0	3	8½
—— 18.	—a leg of mutton, wt.	17¼	at 3¾	0	5	4¾
Feb. 2.	— a buttock of beef wt.	39	at 4	0	13	0
—— 6.	— a ſhoulder of pork, wt.	17¼	at 5½	0	7	10½
—— 12.	— a loin of mutton, wt.	7¼	at 3½	0	2	1¼
				£. 1	17	10½

Feb. 17, 1790. Received the contents, of the above bill, in full. *William Watſon.*

7. John Sims, Blackſmith, does the following jobs for William Dixon, *viz.*—1790, March 2, he makes him a pair of tongs, valued at 3s. 2d.—March 4, he makes him 3 new fenders, at 1s. 11½d. each.—March 8, he mends a lock, and makes a new key to it, for which he charges 10d.—April 2, he ſets him up a new jack, which coſt him 3 guineas, and he charges 7s. 6d. for fitting it up.—April 11, he ſells him a new ſpit for 4s. 6d. and a new grate, wt. 24 lbs. at 5½d. per lb.—On the 3d of May he calls for all the money due to him, which is paid by William Dixon. A bill and receipt is demanded?

8. John Wood desires James Hodgson to write out his bill, which is as follows—1790, Jan. 8, 12 bls. of wheat, at 6s. 9d. per bl. and 15 bls. of maslin, at 5s. 6d. per bl.—Jan. 14, 4 lasts of oats, at 1s. 8½d. per bl. and 3 qrs. of beans, at 5s. 7d. per bl.—Feb. 3, 49 stones of clover seed, at 7s. 2½d. per st. and 6s. 6d. for freight and wharfage.—Feb. 18, 50 bls. of wheat, at 6s. 8d. per bl. and 40 stones of pearl barley, at 2s. 8d. per st.—March 1, 70 bls. of white pease, at 6s. 3½d. and 50 bls. of barley, at 3s. 2d. per bl. A bill and receipt is required, supposing James Hodgson to receive the money from George Brown, John Wood's servant?

9. Jane Hodgson sells Elizabeth Tone the following articles, at sundry times, *viz.*—1790, May 4, 35 yards of silver ribbon, at 2s. 11d. per yard.—May 14, 13½ yards of silk, at 6s. 5½d. per yard.—May 21, 14 black silk cloaks, at 1l. 10s. 2d. each, and 15 black hoods, at 10s. 2d. each.—June 3, 5 French fans, at 4s. 6d. each.—June 8, 15 yards of lutestring, at 5s. 9¼d. per yard.—June 14, 21 pieces of ribbon, at 1l. 1s. 4d. per piece.—Elizabeth Tone gets from Jane Hodgson's shop, the undermentioned goods, *viz.*—May 20, 1790, 18¼ lbs. of bohea tea, at 4s. 2½d. per lb. and 6 lbs. of green tea, at 6s. 8d. per lb.—May 28, 6 lbs. of coffee, at 3s. 1d. per lb.—June 4, a loaf of sugar, wt. 38 lbs. at 1s. 1¼d. per lb.—June 8, 1¼ cwts. of brown sugar, at 6¼d. per lb.—A true state of the above accounts is demanded?

RECEIPTS.

A Receipt is a written acknowledgement which a person receiving money, goods, or writings gives to the payer or deliverer; and may be in full, in part, on his own account, or on another person's account, according as the transaction requires.

RULE

RULE.

Write first the word *received*, then the time when the receipt is given, next the person's name to whom it is given, the value, in words, it is given for, whether it is in full, in part, or on account, on whose behalf it is given, or any other material circumstance respecting the transaction. After which let the receiver sign his name and it is done.

NOTE.

Every receipt for more than forty shillings, and under twenty pounds, must be upon a two-penny stamp. If it be for above twenty pounds it must be upon a four-penny stamp. And if it be in full, or in full of all demands, it must be upon a four-penny stamp, though the sum be less than twenty pounds.

EXAMPLES.

1. Received, September the 1st, 1790, of Mr John Mason, fifteen pounds, in full of all demands.
John Weddell.

2. Received, the 1st of September, 1790, of James Long, Esq. twenty-four pounds, in part of a debt of forty pounds. *John Watson.*

3. Received, September the 1st, 1790, of Mr Robert Dade, ten pounds, on account. *Robert Lee.*

4. Received, the 1st of September, 1790, of Mr Thomas Brass, eighteen pounds twelve shillings, in full for half a year's rent, due at May-day last.
George Croft.

5. Received, September 1st, 1790, of Mr Joseph Dixon, four pounds ten shillings, for a year's interest of one hundred pounds, due July the 26th.
George Brown.

6. Received, September 1st, 1790, of Mrs Jane Hodgson, twelve pounds, in full for a year's wages, due this day, and of all demands. *John Thompson.*

7. Re-

7. Received, September 1ſt, 1790, of Meſſrs Brown and Tone, aſſignees of the eſtate and effects of Joſeph Dixon, a bankrupt, nineteen pounds twelve ſhillings, being my proportion of the firſt dividend of the ſaid bankrupt's eſtate, and is after the rate of two ſhillings and ſix-pence per pound, for my debt of one hundred and fifty-ſix pounds ſixteen ſhillings, proved under the ſaid commiſſion. *John Thompſon.*

8. Received, the 1ſt of September, 1790, of Mr Jonathan Oldman, by the payment of James Bell, four pounds twelve ſhillings, for carpenter's work done by me for him. *John Oliver.*

9. Received, September 1ſt, 1790, of Mr Thomas Banks, fourteen pounds, by the order and for the uſe of Mr John Lamb. *William Longman.*

10. Received, September 1ſt, 1790, of Wilſon and Co. eighty-four pounds, in full, for ſelf and partners. *John Gibſon.*

11. Received, September 1ſt, 1790, of Mr Simon Slow, eleven guineas, on account, for my maſter John Weddell. *William Tone.*

12. Received, September 1ſt, 1790, of James Long, Eſq. a box of writings, for my father, John Arman. *William Arman.*

13. Received, September 1ſt, 1790, of Mr John Thompſon, adminiſtrator of the goods and chattels, rights and credits, of George Brown, late of Gainford, in the county of Durham, deceaſed, one hundred and twenty-four pounds, in full, of a debt owing me by the ſaid George Brown, in his life-time, for ſundry articles ſold to him. I ſay received, in full of all demands, by me, *William Hodgſon.*

14. James Smith received of John Lee, September 1ſt, 1790, twenty-five pounds, for the uſe of his miſtreſs, Jane Hodgſon. The form of his receipt is demanded?

Received, September 1ſt, 1790, of Mr John Lee, twenty-five pounds, for the uſe of my miſtreſs, Jane Hodgſon. *James Smith.*

15. John

15. John Wilſon, ſon of James Wilſon, receives, September 1ſt, 1790, of Mr George Brown, twenty-five guineas and a half, in full, for half a year's rent, due at May-day laſt. The form of a receipt is demanded?

16. If John Long receives, on the 1ſt of September, 1790, fifteen pounds, for a year's intereſt of three hundred pounds, due, on the 28th of Auguſt, from John Watſon, to Meſſrs Bell and Co.; how muſt John Long's receipt be worded?

17. September 1ſt, 1790, John Weddell paid Jane Hodgſon, daughter of Hugh Hodgſon, five guineas, in part of a bill of twenty-four pounds. The form of Jane Hodgſon's receipt is demanded?

18. Chriſtopher Ramſhaw pays John Wood, September 1ſt, 1790, one hundred and fifty pounds, for a legacy left him by James Trenham, his uncle, and charged upon an eſtate left by the ſaid James Trenham to the ſaid Chriſtopher Ramſhaw. The form of a receipt for the above-named money is demanded?

19. September the 1ſt, 1790, John Weddell puts into the hands of Freeman Hilton, a box of writings, containing a number of deeds, a ſchedule of which is kept by the ſaid John Weddell. The form of Freeman Hilton's receipt is deſired to be drawn out?

PROMISSORY NOTES.

A Promiſſory note is a written obligation, which one perſon gives to another, binding himſelf to pay or deliver a certain ſum of money, or a ſpecified quantity of goods, to a perſon named, his order, or to the bearer of the note, at a time fixed, or on demand.

RULE.

Write the name of the place you live at, and the time when the note is drawn, in one line. Then, begin the next line with *I promiſe to pay to*; after which put the perſon's name the note is drawn to, adding *order*

or *bearer* as may be agreed on; next the time of payment; after that the ſum in words; and conclude the whole with either expreſſing on what account the note is given, or with the words *value received*. Then, let the drawer ſign his name, and let it be witneſſed by a perſon or perſons not concerned in the buſineſs, if the perſon receiving the note think it neceſſary:

NOTE.

1ſt. The above is the common method of drawing up a promiſſory note. Other methods are often uſed, but the ſubſtance of them is the ſame.

2d. Every promiſſory note, for leſs than five pounds, muſt be drawn upon a three-penny ſtamp; for five pounds, and ſo on to fifty pounds, it muſt be drawn on a ſix-penny ſtamp; for fifty pounds and upwards, upon a ſhilling ſtamp.

3d. If a note is given to deliver up goods, or writings, you muſt expreſs the particular things, in words, in the ſame place where the ſum is uſually wrote down.

4th. If neither the account for which the note is given, nor the words *value received* are inſerted in the note, it cannot be recovered by law. The note is, alſo, uſeleſs when no tranſaction can be proved reſpecting it for the ſpace of ſix years.

5th. A note drawn to *order* may be paſſed from one perſon to another, by the holder's writing his name on the back thereof, which is called *endorſing* it. If it is drawn to *bearer* it will paſs without endorſing. If neither the words *order* nor *bearer* be contained in the note it cannot be transferred.

6th. Two or more perſons may give a joint note, in which caſe you muſt ſay, *we, jointly and ſeparately, promiſe to pay to*, inſtead of *I promiſe to pay to*. A note is, likewiſe, often given by one perſon, which binds all that are joined in partnerſhip with him, he uſing the words, *for ſelf and Co.* or *for ſelf and partners*, &c.

EX-

EXAMPLES.

1. *Denton, 2d Sept.* 1790.

I promiſe to pay to Mr John Weddell, or order, on demand, ten pounds, for value received. As witneſs my hand. *Joſeph Dixon.*

2. *Denton, 2d Sept.* 1790.

I promiſe to pay to Mr William Rutter, or bearer, on demand, fifty pounds, for value received. As witneſs my hand. *John Peacock.*

3. *Denton, 3d Sept.* 1790.

I promiſe to pay to Mr George Brown, or order, four months after date, nine pounds, for hay bought of him at Gainford, in July laſt. As witneſs my hand. *John Wood.*

4. *Denton, 2d Sept.* 1790.

I promiſe to pay to Mr Freeman Hilton, on the 10th of March next, fifteen pounds, five ſhillings, with legal intereſt for the ſame, the value being this day received from Mr James Wood. *William Rutter.*

Witneſs,
Joſeph Dixon.

5. *Denton, 2d Sept.* 1790.

I promiſe to pay to Miſs Jane Hodgſon, or bearer, on demand, forty-four pounds, twelve ſhillings, the value being received for ſelf and John Watſon.
John Peacock.

6. *Denton, 2d Sept.* 1790.

We, jointly and ſeparately, promiſe to pay to Mr James Ward, or bearer, three months after date, twenty-four pounds, nine ſhillings, for value received. As witneſs our hands.

Witneſs, *John Weddell.*
William Rutter. *George Brown.*

7.

7. *Denton, 2d Sept.* 1790.

I promiſe to pay to Mr Joſeph Dixon, of Denton, or order, twenty-one days after date, four guineas, for value received.

Witneſs, *Richard Wood.*
John Weddell.

8. *Denton, 2d Sept.* 1790.

I promiſe to pay to James Lee, or his order, on or before the firſt of January next, thirty pounds, which I have this day received from John Walſh in a bill on Hooper and Co. London. As witneſs my hand.

Joſeph Dixon.

9. *Denton, 2d Sept.* 1790.

Received of Mr John Day, forty pounds, which I promiſe to pay to him, or his order, on demand, with intereſt for the ſame, after the rate of four pounds for one hundred pounds for a year. As witneſs my hand.

John Wilſon.

10. On the 2d of Sept. 1790, George Brown, of Gainford, borrows twenty pounds of John Weddell, and gives him a note for the money, payable to himſelf or order, on demand. Required the form of George Brown's note?

Gainford, Sept. 2d, 1790.

I promiſe to pay to Mr John Weddell, or order, on demand, twenty pounds, for value received.

George Brown.

11. Johnſon and Co. lend John Lee and James Hart, on the 2d of September, 1790, fifty pounds, for which they give their joint note, payable to themſelves or bearer, at 9 months, with intereſt for the ſame. The form of their note is demanded?

12. James Long borrows of John Wood, Sept. 2d, 1790, five hundred pounds, to be returned to Ruſſell and Co. in 12 months, with intereſt for the ſame. The form of James Long's note is deſired to be made?

13. William

13. William Rutter, of Denton, owes Mr John Ward ſeventeen pounds five ſhillings, and, on the 2d of September, 1790, he gives him a note for it, on demand, but not negotiable. The above note is deſired to be drawn out?

14. John Weddell, ſon of William Weddell, borrows of Mr John Todd, of Denton, September 2d, 1790, fifty pounds, for the uſe of his father; and gives Mr. John Todd a note for it, dated at Yarm, and payable to himſelf or bearer, three months after date. You are deſired to draw up the above note?

15. Thomas Watſon, clerk to Meſſrs Garforth and Co. gives a note to William Rutter, dated York, Sept. 2d 1790, for five hundred pounds, payable to order, fifteen days after date. The form of the above note is demanded?

INTEREST.

INTEREST is the premium that is paid by the borrower to the lender, for the loan or uſe of money; and is of two ſorts, *ſimple* and *compound intereſt*.

SIMPLE INTEREST.

Simple intereſt is the premium that is paid for the uſe of the principal only, no recompence being made to the lender for delay in the payment of the intereſt, how long ſoever it may remain unpaid.

NOTE.

The ſum lent is called *the principal*.

The premium, or conſideration given for the uſe of the principal, is called *the intereſt*.

Which premium is generally at the rate of ſo much, for the uſe of one hundred pounds for a year, called *the rate per cent. per annum*.

The ſum of the principal and intereſt is called *the amount*.

C A S E I.

To find the intereſt of any ſum of money for a year.

R U L E.

Multiply the principal by the rate per cent. then, divide the product by 100, and the quotient will be the intereſt required. Or, take the aliquot part or parts, with the given rate, that are in 100.

N O T E.

It will conſiderably ſhorten the operation, and anſwer the ſame purpoſe, if you cut off two figures to the right-hand of the dividend, inſtead of dividing by 100 at length.

E X A M P L E S.

1. What is the intereſt of 481l. 10s. 6d. for a year, at $4\frac{1}{2}$ per cent. per annum?

$\frac{1}{2}$	$\frac{1}{2}$	£.	s.	d.
		481	10	6
				4
		1926	2	0
		240	15	3
		21,66	17	3
		20		
		13,37		
		12		
		4,47		
		4		
		1,88		
		100		$= \frac{22}{25}$

Or thus.

4	$\frac{1}{25}$	£.	s.	d.
		481	10	6
$\frac{1}{2}$	$\frac{1}{2}$	19	5	$2\frac{1}{2}$
		2	8	$1\frac{1}{4}$
		Anſ. 21	13	$4\frac{1}{4}$

Anſ. 21l. 13s. $4\frac{1}{4}\ \frac{22}{25}$d.

2. When

2. What is the intereſt of 575l. 10s. 2d. for a year, at 5 per cent. per ann? Anſ. 28l. 15s. $6\frac{1}{10}$d.

3. Required the amount of 215l. 11s. 4d. for a year, at 4 per cent. per ann.? Anſ. 224l. 3s. $9\frac{1}{4}$ $\frac{1}{25}$d.

4. I borrowed of my friend 200 guineas, at $4\frac{1}{4}$ per cent. per annum; how much may he demand for intereſt at the year's end? Anſ. 8l. 18s. 6d.

5. John lent Thomas 318l. 11s. 8d. at $4\frac{1}{2}$ per cent. per annum; how much money muſt Thomas return, at the end of one year, to diſcharge the debt?

Anſ. 332l. 18s. $4\frac{1}{2}$ $\frac{4}{7}$d.

6. I borrowed 375l. 10s. 6d. upon bond, at $4\frac{1}{4}$ per cent. per ann. which money I repaid at the end of one year. I paid 16s. 4d. for filling up the bond, and 15s. 3d. for the ſtamp. How much money was I out of pocket by this tranſaction?

Anſ. 394l. 18s. $9\frac{1}{4}$ $\frac{47}{100}$d.

7. I demand the amount of 274 moidores, for a year, at 6 per cent. per ann.? Anſ. 392l. 1s. $10\frac{1}{2}$ $\frac{6}{25}$d.

CASE II.

To find the intereſt of any ſum of money for ſeveral years.

RULE.

Multiply the intereſt of one year, by the number of years, and the product will be the anſwer. Or, multiply the rate per cent. by the time, and take aliquot parts, from the principal, with the product.

EXAMPLES.

1. What is the intereſt of 350l. 11s. 4d. for 12 years, at $4\frac{1}{4}$ per cent. per annum?

		£.	s.	d.
$\frac{1}{2}$	$\frac{1}{2}$	350	11	4
				4
		1402	5	4
$\frac{1}{4}$	$\frac{1}{2}$	175	5	8
		87	12	10

Or thus.

$4\frac{1}{4}$
12
57

£. 16,65 3 10
20
s. 13,03
12
d. 0,46
4
1,84
100 = $\frac{2}{25}$

		£.	s.	d.
50	$\frac{1}{2}$	350	11	4
5	$\frac{1}{10}$	175	5	8
2	$\frac{1}{25}$	17	10	$6\frac{1}{2}$
		7	0	$2\frac{1}{2}$

£. 199 16 $5\frac{1}{2}$ Anſ.

£. s. d.
16 13 $0\frac{1}{4}$ $\frac{2}{25}$
12

£. 199 16 $5\frac{1}{2}$ $\frac{2}{25}$ Anſ.

2. Required the amount of 210l. 15s. 9d. for 7 years, at $3\frac{1}{4}$ per cent. per annum?

Anſ. 258l. 14s. $9\frac{3}{4}$ $\frac{8}{160}$d.

3. I demand the intereſt of 75l. 10s. 2d. for 5 years, at $4\frac{1}{2}$ per cent. per annum? Anſ. 17l. 18s. $7\frac{3}{4}$ $\frac{8}{160}$d.

4. Lent 215 guineas, for 7 years, at 5 per cent. per annum; how much may I demand for both principal and intereſt? Anſ. 304l. 15s. 3d.

5. Borrowed 225l. for 4 years, at $4\frac{3}{4}$ per cent. per annum, and 320l. for 7 years, at $3\frac{1}{4}$ per cent. per annum;

annum; how much money will pay the principal and intereſt of both theſe ſums? Anſ. 671l. 15s. 0d.

6. What is the intereſt of 130 quarter-guineas, and 38 half-guineas, for 9 years, at 5 per cent. per annum? Anſ. 24l. 6s ~~8~~ $\frac{10}{10}$d. $6\frac{3}{4}$

CASE III.

To find the intereſt of any ſum of money, when aliquot parts of a year are uſed.

RULE.

Find the intereſt for one year, out of which take the required parts: then, add this ſum to the intereſt of a year or years, if any be given, and it will be the anſwer.

EXAMPLES.

1. What is the intereſt of 212l. 11s. 6d. for $3\frac{1}{4}$ years, at $3\frac{1}{4}$ per cent. per annum?

		£.	s.	d.
1	1	212	11	6
				3
		637	14	6
¼		106	5	9
		53	2	$10\frac{1}{2}$

£. 7,97 3 $1\frac{1}{2}$

20

s. 19,43

12

d. 5,17

4

70

$= \frac{7}{10}$

100

		£.	s.	d.
¼	½	7	19	$5\frac{0}{4}\frac{7}{10}$
				3
		23	18	$3\frac{1}{2}\frac{1}{10}$
¼	½	3	19	$8\frac{1}{2}\frac{1}{10}$
		1	19	$10\frac{1}{4}\frac{1}{10}$

£. 29 17 $10\frac{1}{4}\frac{1}{10}$ Anſ.

2. Required the amount of 413l. 17s. 4d. for $\frac{1}{4}$ of a year, at $4\frac{1}{4}$ per cent. per annum?

Anſ. 418l. 5s. $3\frac{1}{4}\frac{1}{21}$d.

3. I lent 275l. 11s. 2d. for half a year, at $4\frac{1}{2}$ per cent. per annum; how much intereſt will be due to me?

Anſ. 6l. 4s. $0\frac{0}{4}\frac{3}{10}$d.

4. What is the intereſt of 354l. 11s. 2d. for 11 months, for $3\frac{1}{4}$ per cent. per annum, reckoning 12 months to a year? Anſ. 10l. 11s. $3\frac{0}{4}\frac{9}{17}$d.

5. I demand the amount of 412l. 14s. 8d. for 3 years and 10 months, at 4 per cent. per annum, 12 months being accounted a year?

Anſ. 476l. 0s. $4\frac{1}{2}\frac{17}{20}$d.

6. Lent 140l. 10s. 6d. on a mortgage, at $4\frac{1}{4}$ per cent. per annum; how much will be due to me for intereſt at the end of $5\frac{1}{2}$ years? Anſ. 34l. 6s. $9\frac{1}{2}\frac{4}{21}$d.

7. Find the intereſt of 215 guineas, for $2\frac{1}{4}$ years, at 5 per cent. per annum. Anſ. 30l. 12s. 9d.

CASE IV.

To find the intereſt of any ſum of money, for any number of weeks.

RULE.

Find the intereſt of the given ſum for a year; and then ſtate,—as 52 weeks: are to that intereſt:: ſo are the weeks given: to the intereſt required.

EX-

EXAMPLES.

1. What is the intereſt of 210l. 6s. 8d. for 21 weeks, at $4\frac{1}{4}$ per cent. per annum?

$\frac{1}{4}$	$\frac{1}{4}$	£.	s.	d.
		210	6	8
				4
		841	6	8
		52	11	8
£.		8,93	18	4
				20
s.		18,78		
				12
d.		9.40		
				4
		1.60		
		100		

wſ.	£.	s.	d.	wſ.
As 52 :	8	18	$9\frac{1}{4}$	: : 21
		20		
	178			
		12		
	2145			
		4		
	8581			
		21		
	8581			
	17162			
52)180201(3465 (4)				
	156			
	12)866$\frac{1}{4}$			
	242			
	208			
	2,0)7,2		$2\frac{1}{4}$	
	340	£. 3	12	$2\frac{1}{4}$ Anſ.
	312			
	281			
	260			
	21			
	52			

2. Re-

2. Required the intereſt of 318l. 15s. 7d. for 3 years and 38 weeks, at $3\frac{1}{4}$ per cent. per annum?

Anſ. 44l. 11s. $11\frac{1}{2}$d.

3. Find the amount of 30 guineas, for 1 year and 29 weeks, at 4 per cent. per annum.

Anſ. 33l. 9s. $2\frac{1}{4}$d.

4. I demand the intereſt of 610l. 11s. 8d. for 2 years and 3 weeks, at $4\frac{1}{4}$ per cent. per annum?

Anſ. 53l. 7s. 11d.

5. Find the amount of 310 moidores, for 19 weeks, at $4\frac{1}{4}$ per cent. per annum. Anſ. 425l. 15s. 3d.

CASE V.

To find the intereſt of any ſum of money, for any number of days.

RULE.

Find the intereſt of the given ſum for a year; and then ſtate,—as 365 days: are to that intereſt:: ſo are the days given: to the intereſt required.

EX.

EXAMPLES.

1. Required the amount of 350l. 10s. 8d. for 4 years and 61 days, at $3\frac{1}{2}$ per cent. per annum?

		£.	s.	d.
$\frac{1}{2}$	$\frac{1}{2}$	350	10	8
				3
		1051	12	0
$\frac{1}{4}$	$\frac{1}{2}$	175	5	4
		87	12	8
£.		13,14	10	0
		20		
s.		2,90		
		12		
d.		10,80		
		4		
		3,20 = $\frac{1}{5}$		
		100,		

£.	s.	d.	
13	2	$10\frac{3}{4}$	= $\frac{1}{7}$
		4	
52	11	$7\frac{0}{4}$, $\frac{4}{7}$	
2	3	11	
350	10	8	
£. 405	6	$2\frac{0}{4}$, $\frac{4}{7}$	Anf.

ds.	£.	s.	d.	ds.
As 365	: 13	2	$10\frac{3}{4}$	: : 61
	20			
	262			
	12			
	3154			
	4			
	12619			
	61			
	12619			
	75714			
365)769759(2108				(4)
	730			
	12)527			
	365	2,0)4,3	11	
	3259	£. 2	3	11
	2920			
	339			
	365			

2. What is the intereſt of 26l. 10s. 4d. for 40 days, at $4\frac{1}{2}$ per cent. per annum? Anſ. 0l. 2s. $7\frac{1}{4}$, $\frac{15}{17}$d.

3. What

3. What is the amount of 130l. 10s. 6d. for two years, 7 months, and 13 days, at 5 per cent. per annum?
Anſ. 147l. 12s. 4d.

4. Required the intereſt of 150 guineas, for 78 days, at $4\frac{1}{2}$ per cent. per annum? Anſ. 1l. 10s. $3\frac{1}{2}\ \frac{2}{73}$d.

5. On the 10th of May, 1789, I borrowed 60l. 10s. 8d. which I repaid on the 26th of December in the ſame year. How much will be due for intereſt, at $3\frac{1}{2}$ per cent. per annum? Anſ. 1l. 6s. $8\frac{5}{4}\ \frac{1}{7}$d.

6. John left his daughter Jane, by will, 675l. 12s. 6d. to be paid her when ſhe came of age, with intereſt at $4\frac{1}{4}$ per cent. per annum. Now ſhe came to age in 6 years and 301 days; what has ſhe to receive in all?
Anſ. 894l. 12s. $10\frac{1}{4}$d.

REMARK.

The method of reckoning time, with reſpect to intereſt, is different in one place from another. In the courts of law, intereſt is always computed in years, quarters, and days; at the Bank of England, the South Sea Houſe, and the India Houſe, it is reckoned by calendar months and days; and at the Exchequer, in quarters of a year and days.

CASE VI.

When the amount, time and rate per cent. are given to find the principal.

RULE.

State,—as the amount of 100l. at the rate and for the time given : is to 100l. : : ſo is the amount given : to the principal required.

EX-

EXAMPLES

1. What principal, being put to intereſt for $4\frac{1}{2}$ years, at 4 per cent. per annum, will amount to 274l. 7s. 0d?

		£.	£.	£. s. d.	
$4\frac{1}{2}$	As	118 :	100 : :	274 7 0	$4\frac{1}{2}$
4		20		20	4
18		2360		5487	18
100				100	
118				£. s.	
		236,0)54870,0(232		10 Anſ.	
		472			
		767			
		708			£. s. d.
			10	$\frac{1}{10}$	232 10 0
		590			
		472	5	$\frac{1}{2}$	23 5 0
			2	$\frac{1}{5}$	11 12 6
		118	1	$\frac{1}{2}$	4 13 0
		20			2 6 6
		s.			
		236)2360(10			41 17 0
		236			232 10 0
		0		Proof	274 7 0

2. What principal being put to intereſt, for $5\frac{1}{2}$ years, at $4\frac{1}{2}$ per cent. per annum, will amount to 467l. 16s. 3d.? Anſ. 375l.

3. What principal being put to intereſt, for $7\frac{1}{4}$ years, at $3\frac{1}{4}$ per cent. per annum, will amount to 219l 8s. $1\frac{1}{2}$d.? Anſ. [illegible]l.

CASE VII.

When the principal, rate per cent. and amount are given, to find the time.

RULE.

RULE.

State,—as the intereſt of the principal for 1 year : is to one year : : ſo is the whole intereſt : to the time required.

EXAMPLES.

1. In what time will 690l. amount to 777l. 19s. 6d. at $4\frac{1}{4}$ per cent. per annum?

$\frac{1}{4}$	$\frac{1}{4}$	690	£.	s.	d.	y.	£.	s.	d.
		4	As 29	6	6	: 1 : :	87	19	6
		2760		20				20	
		172 10	586				1759		
				12				12	
		£. 29,32 10	7038				7038)21114(		3 Anſ.
		20					21114		
		s. 6,50					.....		
		12							
		d. 6,00	$4\frac{1}{4}$			10 | $\frac{1}{10}$	£.	s.	d.
			3				690	0	0
		£. s. d.				2 | $\frac{1}{2}$	69	0	0
		777 19 6	$12\frac{3}{4}$			$\frac{1}{2}$ | $\frac{1}{4}$	13	16	0
		690 0 0				$\frac{1}{4}$ | $\frac{1}{8}$	3	9	0
							1	14	6
		87 19 6					87	19	6
							690	0	0
						Proof	777	19	6

2. In what time will 420l. amount to 520l. 16s. at 3 per cent. per annum? Anſ. 8 years.

3. In what time will 100l. double itſelf, at 4 per cent. per annum? Anſ. 25 years.

4. In

4. In what time will 350l. amount to 445l. 11s. 10½d. at 4¼ per cent. per annum? Anſ. 5¼ years.

CASE VIII.

When the principal, amount, and time are given, to find the rate per cent.

RULE.

State,—as the principal : is to the intereſt for the whole time :: ſo is 100l. : to the intereſt for the ſame time. Then, divide the intereſt by the given time, and the quotient will be the rate per cent. required.

EXAMPLES.

1. At what rate per cent. per annum will 620l. amount to 793l. 12s. in 7 years?

£.	s.
793	12
620	0
173	12

As 620 : 173 12 : : 100 : 7

20

3472

180

(2,0)

62,0)34720,0(560

310

7)28

372

372 Anſ. 4 per cent.

...0

£.		
25	¼	620 0 0
2	⅒	155 0 0
1	½	12 8 0
		6 4 0
		173 12 0
		620 0 0
	Proof	793 12 0

2. At what rate per cent. per annum will 100l. double itſelf in 20 years?

Anſ. 5 per cent.

3. At what rate per cent. per annum will 498l. 6s. 8d. amount to 614l. 3s. 11d. in $7\frac{1}{4}$ years?

Anſ. 3 per cent.

4. At what rate per cent. per annum will 350l. amount to 470l. 10s. $7\frac{1}{2}$d. in $7\frac{1}{4}$ years?

Anſ. $4\frac{3}{4}$ per cent.

COMMISSION.

Commiſſion is an allowance made by the merchant to his factor or correſpondent for buying or ſelling goods for him, and is generally at ſo much per cent.

RULE.

If the commiſſion be under one per cent., divide the given ſum by 100, and take aliquot parts, from the quotient, with the commiſſion; if it be above one per cent. work by caſe 1ſt of ſimple intereſt; if it be to be paid in a different way, it muſt be calculated as the agreement ſpecifies.

NOTE.

Brokerage and inſurance are both calculated in the ſame manner as commiſſion.

EXAMPLES.

1. What is the commission of 307l. 16s. 8d. at $3\frac{1}{2}$ per per cent.?

		£.	s.	d.
$\frac{1}{2}$	$\frac{1}{2}$	307	16	8
				3
		923	10	0
		153	18	4
	£.	10,77	8	4
		20		
	s.	15,48		
		12		
	d.	5,80		
		4		
		3,20		
		100	$=\frac{1}{5}$	

Anſ. £. 10 s. 15 d. $5\frac{1}{2}$, $\frac{1}{5}$.

2. Suppoſe I allow my correſpondent $2\frac{1}{4}$ per cent. for his commiſſion; what is his demand for laying out 575l. 17s. 2d.? Ani. 12l. 19s. $1\frac{1}{2}$, $\frac{7}{10}$d.

3. My factor writes me word that he has bought goods for me to the amount of 695l. 10s. 8d; what will his commiſſion come to at $3\frac{1}{4}$ per cent.?
Anſ. 26l. 1s. $7\frac{1}{4}$, $\frac{1}{5}$d.

4. If I allow my agent $1\frac{7}{8}$ per cent.; how much will be due to him for diſburſing 383l. 11s. 11d. on my account? Anſ. 7l. 3s. $10\frac{0}{4}$, $\frac{7}{10}$d.

5. I demand the commiſſion of 375l. 11s. 8d. at $6\frac{1}{4}$d. per pound? Anſ. 10l. 11s. $3\frac{0}{4}$, $\frac{1}{4}$d.

6. My agent has 11¼d. per pound on money received for me, and 3½d. per pound on money paid for me; how much is due to him for receiving 834l. 16s. 8d. and paying 382l. 11s. 9d.? Anſ. 45l. 11s. 7½d.

BROKERAGE.

Brokerage is a premium or allowance paid to a perſon, called a broker, for aſſiſting merchants, or factors, in buying or diſpoſing of goods, or any other property.

EXAMPLES.

1. What is the brokerage of 387l. 10s. 9d. at 6s. 6d. per cent.?

£.	s.	d.
£. 3,87	10	9
20		
s. 17,50		
12		
d. 6,09		
4		
36		
100		= 2 6/25

s.	d.		£.	s.	d.
5	0	¼	3	17	6
1	0	½	0	19	4½
0	6	½	0	3	10½
			0	1	11¼

£. 1 5 2¼ Anſ.

2. I demand the brokerage of 394l. 12s. 8d. at 2s. 10½d. per cent.? Anſ. 11s. 3¾d.

3. A broker ſold goods to the amount of 654l. 11s. 8¼d.; what may he charge for brokerage, at 11s. 7d. per cent.? Anſ. 3l. 15s. 9¾d.

4. If I allow a broker 6/7 per cent.; what will his brokerage come to on 1385l. 10s. 7¼d.?

Anſ. 11l. 17s. 6 6/7 d.

5. Required the brokerage on 715l. 10s. 6d. at 19s. 11d¼. per cent.? Anſ. 7l. 2s. 7¼d.

6. Find

6. Find the brokerage of 350l. 16s. 8d. at $8\frac{1}{4}$d. per pound. Anſ. 12l. 15s. $9\frac{1}{8}$ $\frac{1}{8}$d.

7. If a broker buys goods to the amount of 5081. 17s. 10d.; what is his demand at $1\frac{1}{2}$ per cent.?
Anſ. 6l. 19s. 11d.

INSURANCE.

Inſurance is the premium that is given upon an agreement with certain perſons or offices, who undertake to pay a ſpecified ſum, upon the damage or loſs of a ſhip, a houſe, or any article of merchandiſe, by ſtorm, fire, &c. or upon the death of one or more perſons named in the agreement.

EXAMPLES.

1. What is the inſurance of 1271l. 17s. $8\frac{1}{4}$d. at 3s. 4d. per cent.?

£.	s.	d.		s.	d.		£.	s.	d.
12,71	17	$8\frac{1}{4}$		3	4	$\frac{1}{6}$	12	14	$4\frac{1}{2}$
20									
s. 14,37							£. 2	2	$4\frac{1}{2}$ Anſ.
12									
d. 4,52									
4									
2,09									
100									

2. I demand the inſurance of 495l. 10s. 3d. at $1\frac{1}{7}$ per cent.? Anſ. 8l. 9s. $10\frac{3}{4}$, $\frac{1}{7}$d.

3. Required the inſurance of 3874l. 10s. 8d. at 2s. 9d. per cent.? Anſ. 5l. 6s. $6\frac{1}{4}$d.

4. If I pay 3 guineas per cent.; how much muſt I pay for inſuring 8764l. 11s. 8d.?

Anſ. 276l. 1s. 8¼d.

5. What is the inſurance of 1360l. 11s. 8d. at 18s. 7¼d. per cent.? Anſ. 12l. 13s. 0¼d.

BUYING and SELLING of STOCKS.

STOCK is the name by which the money due from government to the public, and the capitals of trading companies, are diſtinguiſhed. Buying and ſelling ſums or ſhares of theſe is now become an article of trade.

RULE.

If the ſum given is under *par*, that is, under 100 per cent. multiply it by the price, and divide by 100 for the anſwer; and if the ſum is above par, multiply it by the exceſs above 100, divide the product by 100, and add the quotient to the given ſum for the anſwer.

EX-

EXAMPLES.

1. Required the purchaſe of 1250l. 10s. 6d. India ſtock, at 107$\frac{1}{8}$ per cent.?

		£.	s.	d.
		1250	10	6
$\frac{3}{4}$	$\frac{1}{4}$			7
		8753	13	6
$\frac{1}{8}$	$\frac{1}{2}$	312	12	$7\frac{1}{2}$
		156	6	$3\frac{3}{4}$
	£.	92,22	12	$5\frac{1}{4}$
		20		
	s.	4,52		
		12		
	d.	6,29		
		4		
		1,17		
		100		

£.	s.	d.	
1250	10	6	
92	4	$6\frac{1}{4}$	
£. 1342	15	$0\frac{1}{4}$	Anſ.

2. What is the purchaſe of 575l. 10s. 8d. three per cent. annuities, at 88$\frac{1}{4}$ per cent?

Anſ. 507l. 18s. $1\frac{1}{4}\frac{2}{17}$d.

3. Bought 835l. 11s. 4d. bank annuities, at 91$\frac{1}{2}$ per cent. and paid $\frac{1}{8}$ per cent. brokerage; what did the bargain coſt me in all? Anſ. 767l. 13s. $6\frac{1}{4}$d.

4. Value 8185l. 11s. 8d. South Sea ſtock, at 111$\frac{7}{8}$ per cent. Anſ. 9144l. 9s. $3\frac{1}{2}$d.

5. Sold 3175l. 15s. 7d. three per cent. conſolidated bank annuities, at 94$\frac{7}{8}$ per cent.; how much money will be due to me if I allow my broker 3l. 18s. $8\frac{1}{2}$d. for his trouble? Anſ. 2994l. 18s. $1\frac{1}{2}$d.

6. Bought 1310l. 6s. 8d. India ſtock, at 104$\frac{1}{8}$ per cent. how much did it coſt me? Anſ. 1370l. 0s. $6\frac{1}{4}$d.

COM-

COMPOUND INTEREST.

Compound intereſt is the premium that is paid for the uſe both of the ſum lent, and alſo of its intereſt, as it becomes due, at the end of each ſtated time of payment.

RULE.

Find the amount of the given ſum, for the time fixed for the firſt payment, by ſimple intereſt. Call this amount the principal for the ſecond payment, whoſe amount calculate as before. Proceed in this manner till you have calculated for all the payments given, and the difference between the firſt ſum and the laſt amount, will be the compound intereſt required.

NOTE.

1ſt. This rule holds good whether the payments be made yearly, half-yearly, quarterly, monthly, or any other aliquot part of a year. But when the payments are yearly, or half-yearly, &c. and the intereſt is required for the odd parts of a year, or half-year, &c. decimals, or rather logarithms, muſt be uſed to make a true calculation.

2d. When the payments are yearly or half-yearly, &c. and the intereſt is required for odd months and days beſides years, &c. the common way is to find the intereſt for one payment more than the number given, and to take the odd parts from that payment, then to add them to the ſum before found, for the anſwer. This method will ſerve where particular exactneſs is not required.

REMARK.

It is not lawful to lend money at compound intereſt, but in purchaſing of annuities, penſions, leaſes, or eſtates

eſtates in reverſion, compound intereſt is uſually allowed to the purchaſer for his ready money, and therefore it is neceſſary that it ſhould be underſtood.

EXAMPLES.

1. What is the compound intereſt of 400l. forborn 3 years, at 4 per cent. per annum?

£. 400=1ſt. y's. p.
4
£. 16,00

£. 400
16
416=2d. ys. p.
4
16,64
20
s. 12,80
12
d. 9,60
4
2,40

£. s. d.
416 0 0
16 12 9½
432 12 9½=3d. ys. p.
4
£. 17,30 1,1 2:
20
s. 6,11
12
d. 1,36
4
1,36

£. s. d.
432 12 9½
17 6 1¼
449 18 10¼ the amount.
400 0 0 the principal.
£. 49 18 10¼ Anſ.

6.

Or thus.

£.	s.	d.	
$4=\frac{1}{25}$)400	0	0	=1ft. ys. p.
16	0	0	=1ft. ys. in.
$\frac{1}{25}$)416	0	0	=2d. ys. p.
16	12	$9\frac{1}{2}$	=2d. ys. in.
$\frac{1}{25}$)432	12	$9\frac{1}{2}$	=3d. ys. p.
17	6	$1\frac{1}{4}$	=3d. ys. in.
449	18	$10\frac{3}{4}$	the amount.
400	0	0	the principal.
£. 49	18	$10\frac{3}{4}$	the in. or Anſ.

2. What will 120l. amount to, in 4 years, at $4\frac{1}{2}$ per cent. per annum, compound intereſt?
Anſ. 143l. 2s. $0\frac{1}{4}$d.

3. What is the compound intereſt of 410l. forborn $2\frac{1}{2}$ years, at $4\frac{1}{2}$ per cent. per annum, ſuppoſing the intereſt payable half-yearly? Anſ. 48l. 4s. $11\frac{1}{4}$d.

4. Find the amount of 450l. 10s. forborn 3 years, at $4\frac{1}{2}$ per cent. per annum? Anſ. 514l. 1s. $10\frac{1}{2}$d.

5. What will 500l. amount to, in 4 years, at $4\frac{1}{4}$ per cent. per annum, compound intereſt?
Anſ. 590l. 11s. $5\frac{1}{2}$d.

6. Required the amount of 135l. 10s. 6d. forborn $1\frac{3}{4}$ years, at 4 per cent. per annum, ſuppoſing the intereſt payable quarterly? Anſ. 145l. 5s. $11\frac{1}{4}$d.

7. I demand the ſeveral amounts of 600l. payable yearly, half-yearly, and quarterly, being forborn 2 years, at $4\frac{1}{4}$ per cent. per annum, compound intereſt?
Anſ. 658l. 7s. $0\frac{1}{4}$d.—659l. 1s. $2\frac{1}{2}$d.—659l. 8s. $5\frac{1}{2}$d.

8. What

8. What is the compound intereſt of 160l. forborn 2 years, 9 ms. 15 ds. at 5 per cent. per annum?

£.	£.	£. s.
160=1ſt ys. p.	160	168 0
5	8	8 8
£. 8,00	168=2d. ys. p.	176 8=3d. ys. p.
	5	5
	£. 8,40	£. 8,82 0
	20	20
	s. 8,00	s. 16,40
		12
		d. 4,80
		4
		3,20

ms.	ds.		£.	s.	d.
6	0	½	8	16	4¼
3	0	½	4	8	2¼
0	15	⅛	2	4	1
			0	7	4
			6	19	7¼
			176	8	0
			183	7	7¼
			160	0	0
		Anſ.	23	7	7¼

9. What is the compound intereſt of 4093l. forborn 4 years, 10 mos. 15 ds. at 5 per cent. per annum?

Anſ. 1099l. 14s. 5½d.

10. What

10. What is the amount of 440l. 16s. for 3 years, 11 ms. 10 ds. at 3½ per cent. per annum, compound interest? Anſ. 508l. 3s. 3¼d.

REBATE or DISCOUNT.

Rebate or diſcount is an allowance made for the preſent payment of money due at any time to come; and is the difference between the money due at the time mentioned and its preſent worth.

Preſent worth is that ſum which would, if put out to intereſt at the rate per cent. and for the time agreed upon, amount to the money which is to be diſcounted.

RULE.

When the diſcount is required,—ſtate,—as the amount of 100 pounds for the given rate and time : is to the intereſt of 100 pounds : : ſo is the ſum given : to the diſcount. And, when the preſent worth is required,—ſtate,—as the amount of 100 pounds for the given rate and time : is to 100 pounds : : ſo is the ſum given : to the preſent worth.

REMARK.

Bankers, &c. when they diſcount bills, find the intereſt of the ſum drawn for, from the time when the bill is diſcounted to the time when it becomes due, including the days of grace, which intereſt they reckon as the diſcount, thereby making the diſcount more than it really is.

But when goods are bought or ſold, and diſcount is to be made for preſent payment, at any rate per cent. without regard to time, the intereſt of the ſum is calculated for a year in the diſcount.

EX-

EXAMPLES.

1. What is the preſent worth of 356l. 10s. due 9 months hence, diſcount at 5 per cent. per annum?

ms.		£.	s.	d.
6	½	5	0	0
3	¼	2	10	0
		1	5	0
		3	15	0
		100	0	0
£.		103	15	0

As 103 15 : 100 :: 356 10

20

2075

20

7130

100

713000

£. s. d.

2075)713000(343 12 3¼ Anſ.

6225

9050

8300

7500

6225

1275

20

2075)25500(12s.

2075

4750

4150

600

12

2075)7200(3d.

6225

975

4

2075)3900(¼

2075

1825 = 75/83

2075

2. What is the discount of 110l. 15s. 0d. due 11 weeks hence, at $4\frac{1}{2}$ per cent. per annum?
Anf. 1l. 2s. $0\frac{1}{2}$d.

3 How much ready money will discharge a note of 73l. due 17 months hence, discount at 5 per cent. per annum? Anf 68l. 3s. $5\frac{3}{11}$d.

4. What is the present worth of 685l. 11s. 8d. due 287 days hence, at $3\frac{1}{4}$ per cent. per annum?
Anf. 665l. 19s. $0\frac{1}{4}$d.

5. Find the rebate of 120l. due $2\frac{1}{4}$ years hence, at $4\frac{1}{4}$ per cent. per annum? Anf. 12l. 11s. $1\frac{1}{2}$d.

6. If a legacy of 250l. be left me, on the 10th of September, to be paid on the 5th of April following; what muft I receive when I allow 4 per cent. per annum discount for present payment? Anf. 244l. 9s. 2d.

7. What is the discount of 130l. 15s. 6d. due October 10th, this being May 2d, reckoning interest at 4 per cent. per annum? Anf. 2l. 5s. $7\frac{1}{4}$d.

8 What is the present worth of 190l. 11s. 8d. payable as follows, viz. 60l. at 4 months, 90l. at 6 months, and the reft at 9 months, discount at 4 per cent. per annum? Anf. 186l. 16s. 11d.

9. The ready money price of a quantity of goods was 210l, which goods were sold for 236l. 10s. 6d. payable 13 ms. hence. What was the gain in ready money, fuppofing discount to be made at $4\frac{1}{2}$ per cent. per annum? Anf. 15l. 10s. $7\frac{1}{4}\ \frac{140}{313}$d.

10. Required the rebate of 196l. 16s. 0d. payable $\frac{1}{4}$ at 3 months, and the reft at 9 months, at 5 per cent. per annum? Anf. 5l. 18s. 10d.

11. What difference is there between the interest of 250l. at 4 per cent per annum, for 9 years, and the discount of the fame fum, at the fame rate, and for the fame time? Anf. 23l. 16s. $5\frac{1}{2}\ \frac{10}{17}$d.

12. I demand the present worth of 410l. 10s. 8d. due as follows, viz. 50l. present, 100l. at 7 ms. 200l. at 11 ms. and the reft at 13 ms. discount at $4\frac{1}{4}$ per cent. per annum? Anf. 397l. 18s. $11\frac{1}{4}$d.

EQUATION

EQUATION of PAYMENTS.

Equation of payments is the finding a time, to pay at once, ſeveral ſums, due at different times, ſo that neither receiver nor payer may ſuſtain loſs.

RULE.

Multiply each payment by the time it is due at, then divide the ſum of the products by the ſum of the payments, and the quotient will be the equated time.

EXAMPLES.

1. John owes Thomas 300l. to be paid 50l. at 2 months, 100l. at 5 months, and the reſt at 8 months; but they agreed that the whole ſhould be paid at one time; when muſt that time be?

£.	£.	£.	£.
50	100	150	100
2	5	8	500
			1200
100	500	1200	
			3,00)18,00
			Anſ. 6 ms.

2. Find the equated time of 20l. due at 1 month, 50l. due at $3\frac{1}{2}$ months, and 76l. due at 5 months.

Anſ. 3 ms. 28 $\frac{11}{13}$ ds.

3. James owes Edward a certain ſum, which is to be diſcharged in the following manner, viz. $\frac{1}{3}$ at 3 months, $\frac{1}{4}$ at 4 months, $\frac{1}{5}$ at 6 months, and the reſt at 9 months; but they afterwards agree to have an equated time for the payment of the whole; that time is required? Anſ. 5 ms. 4 $\frac{1}{2}$ ds.

4. A perſon has 50l. due to him at 2 months, 80l. at 5 months, and 120l. at 9 months, but would have the whole paid together; the equated time is required?

Anſ. 6 ms. 9 $\frac{1}{3}$ ds.

5. Johnſon is indebted to Watſon 25l. 3s. 9d. to be paid at $3\frac{1}{2}$ months, 84l. 10s. 8d. to be paid at 5 months, and 97l. 12s. 8d. to be paid at $8\frac{1}{2}$ months; what is the equated time for payment of the whole?

Anſ. 6 ms. 13 ds.

6. Robert buys of Roger, on the 8th of September, goods to the value of 380l. 10s. 6d. to pay 125l. 6s. 8d. on the 1ſt of November, and the remainder on Chriſtmas-day; but they afterwards agreed that the whole ſhould be paid at once; the equated time is demanded? Anſ. 90 days.

7. A debt of 250l. is to be diſcharged thus, viz. 50l. preſent, 150l. at 4 months, and the reſt at 6 months; what is the equated time for the whole?—Anſ. $3\frac{1}{7}$ ms.

8. John owes Thomas 480l. to be paid at 6 months, but he pays him 120l. at 1 month and $\frac{1}{2}$, and 160l. more at 4 months and $\frac{1}{2}$; how much longer than 6 months ought Thomas in equity to defer the reſt? Anſ. $3\frac{6}{78}$ ms.

REMARK.

The above rule is not ſtrictly accurate, but it is ſufficiently ſo for common practice, and is the moſt eligible method that can be uſed in buſineſs, as the true rule is very tedious to work by.

FELLOWSHIP.

FELLOWSHIP is a rule by which merchants, trading in company, calculate their proper ſhares of the gain or loſs; or by which the effects of brankrupts may be juſtly divided amongſt their creditors; legacies may be adjuſted when the effects are deficient; commons may be divided among the proprietors of land; and any other tranſaction, in company, may be ſettled in proportion to the juſt intereſt of every partner.

SINGLE FELLOWSHIP.

Single fellowſhip is when calculations, in partnerſhip, are made by conſidering the ſhares only, without any

any regard to the difference of time they have been employed.

R U L E.

State,—as the ſum of the ſeveral ſhares : is to the whole gain, loſs, ſum, or thing to be divided : : ſo is each perſon's particular ſhare : to his ſhare of the gain, loſs, ſum, or thing to be divided.

P R O O F.

Add into one ſum all the reſults of the different ſtatings, and their ſum will be equal to the ſecond term in the proportion, if the queſtion is right.

E X A M P L E S.

1. Abraham, John, and Edward trade in company with a ſtock of 600l. of which Abraham advanced 100l. John 200l. and Edward the reſt. The whole gain was 350l.; how muſt it be ſhared amongſt them?

£.			£.	£.	£.
100	Abraham's ſtock	As	600	: 350	: : 100
200	John's ſtock			100	
300	Edward's ſtock				
600	the whole ſtock		6,00	)350,00	

£. 58 6 8 Abraham's gain

	£.	£.	£.		£.	£.	£.
As	600	: 350	: : 200	As	600	: 350	: : 300
		200				300	
	6,00	)700,00			6,00	)1050,00	

£. 116 13 4 John's gain £. 175 Edward's gain

£.	s.	d.	
58	6	8	Abraham's gain
116	13	4	John's gain
175	0	0	Edward's gain
£. 350	0	0	Proof

2. Three perſons traded in company. A put into ſtock 128l. B 130l. and C 150l. 15s. The neat gain was 119l. 4s. 0d.; what was each perſon's ſhare?

	£.	s.	d.	
Anſ.	37	6	$6\frac{1}{2}$,	$\frac{2070}{8775}$ A's gain.
	37	18	$2\frac{7}{25}$,	$\frac{2250}{8775}$ B's gain.
	43	19	$2\frac{3}{4}$,	$\frac{2025}{8775}$ C's gain.

3. A tradeſman breaking owes John 410l. 11s. 6d. Thomas 313l. 7s. 2d. Richard 250l. 11s. 8d. and William 100 guineas. His effects are only worth 680l. 11s. 2d.; what will the dividend of each creditor be?—Anſ. John's dividend is 258l. 16s. $9\frac{0}{25}\frac{19411284}{25008400}$d. Thomas's is 197l. 11s. $0\frac{0}{25}\frac{2478400}{25008400}$d. Richard's is 157l. 19s. $5\frac{3}{25}\frac{2431020}{25008400}$d. and William's is 66l. 3s. $10\frac{1}{25}\frac{5625200}{25008400}$d.

4. John, by will, leaves Robert 250l. John 300l. James 160l. and 280l. to Edward; but his effects are found to amount only to 530l. 11s. 6d. How much will every legatee be entitled to receive?—Anſ. Robert muſt receive 133l. 19s. $8\frac{24}{99}$d. John, 160l. 15s. $7\frac{9}{99}$d. James, 85l. 14s. $11\frac{11}{99}$d. and Edward 150l. 11s. $2\frac{25}{99}$d.

5. A piece of ground conſiſting of 137 as. 2 rs. 14 ps. is to be divided among three perſons, A, B, and C, in proportion to their eſtates. A's eſtate was worth 500l. a year, B's 320l. and C's 175l.; what quantity of land muſt each one have?—Anſ. A muſt have 69 as. $22\frac{110}{995}$ ps. B, 44 as. $39\frac{875}{995}$ ps. and C, 24 as. $31\frac{805}{995}$ ps.

6. The effects of a bankrupt, amounting to 250l. are to be divided among his three creditors, Chriſtopher, George, and John. To the firſt of theſe he owes 100l. to the ſecond 150l. and to the third 200l. What does he pay per pound, and what does each creditor receive for his ſhare?—Anſ. he pays 11s. $1\frac{1}{3}$d. per pound. Chriſtopher receives 55l. 11s. $1\frac{1}{3}$d. George 83l. 6s. 8d. and John 111l. 2s. $2\frac{2}{3}$d.

7. John and Thomas put equal ſums into trade, and gain 308l. John, by agreement, was to have 9 per cent. becauſe he managed the buſineſs, and Thomas was only to have 5 per cent.; what was John allowed for his trouble?—Anſ. 110l.

8. Three

8. Three merchants, William, Robert, and Thomas, trade together, and with a ſtock of 400l. they gained as follows, viz. William 30l. Robert 48l. and Thomas 42l.; what was each man's ſtock?—Anſ. William's ſtock was 100l. Robert's ſtock was 160l. and Thomas's ſtock was 140l.

9. George Brown and John Weddell export 255 pieces of cloth, which were loſt at ſea. George's part was to John's as 3 to 7; what is each man's loſs at 9l. 17s. per piece?—Anſ. George Brown loſt 753l. 10s. 6d. and John Weddell 1758l. 4s. 6d.

10. A father, ignorant in numbers, ordered 1000l. to be divided amongſt his five ſons, thus, give A, ſays he, $\frac{1}{3}$, B, $\frac{1}{4}$, C, $\frac{1}{5}$, D, $\frac{1}{8}$, and E, $\frac{1}{7}$. Part this equitably amongſt them according to the father's intention?

		£.	s.	d.
Anſ.	A's ſhare - -	305	0	$2\frac{1}{2}$ $\frac{210}{459}$
	B's ſhare - -	228	15	$1\frac{3}{4}$ $\frac{387}{459}$
	C's ſhare - -	183	0	$1\frac{1}{2}$ $\frac{126}{459}$
	D's ſhare - -	152	10	$1\frac{1}{4}$ $\frac{105}{459}$
	E's ſhare - -	130	14	$4\frac{1}{2}$ $\frac{90}{459}$

DOUBLE FELLOWSHIP.

Double fellowſhip is when there is a difference both in the ſhares and in the time they have been employed.

RULE.

Multiply each particular ſhare by the time it has been employed, and then ſtate, as the ſum of theſe products: is to the whole article to be divided: : ſo is each perſon's product ſeparately: to his ſhare of the article to be divided.

PROOF.

The method of proof is the ſame as in ſingle fellowſhip.

EXAMPLES.

1. John, Thomas, and Joſeph rent a field for 50l. a year, into which John put 140 ſheep for 130 days, Thomas 70 ſheep for 110 days, and Joſeph 80 ſheep for

for 150 days. What part of the rent ought each man to pay?

140×130= 18200 John's ſtock and time
70×110= 7700 Thomas's ſtock and time
80×150= 12000 Joſeph's ſtock and time

37900 the whole ſtock and time

£.
As 37900 : 50 : : 18200
50

379,00)9100,00(24 0 2½ 50/379 John's rent
758

1520
1516
4
20
80
12
d.
379)960(2
758
202
4
379)808(½
758
50
379

£.
As 37900 : 50 : : 7700
50 £. s. d.
379,00)3850,00(10 3 1½ 371/379 Tho's rent
379

60
20
s.
379)1200(3
1137
63
12
d.
379)756(1
379
377
4
379)1508(¾
1137
371
379

As

£.
As 37900 : 50 : : 12000
50

379,00)6000,00(15 16s 7¼ 3/379 Joseph's rent
379
2210
1895
315
20
379)6300(16s.
379
2510
2274
236
12
379)2832(7d.
2653
179
4
379)716(1/4
379
337
379

Anf. £. s. d.
24 0 2½ 1/379 John's rent.
10 0 1¼ 1/379 Thomas's rent.
15 16 7¼ 3/379 Joseph's rent.
Proof 50 0 0 the whole rent.

2. Three merchants join in trade. A put in 40l. for 9 months, B 68l. for 5 months, and C 120l. for 12 months; but by misfortune they loft goods to the value of 50l.; what muft each man fuftain of the lofs?—Anf. A muft lofe 8l. 8s. 2½ 164/174d. B muft lofe 7l. 18s. 10½ 136/174d. and C muft lofe 33l. 12s 10¼ 174/174d.

3. A

3. A bankrupt's effects, worth 500l, are to be divided amongſt his three creditors, D, E, and F, in proportion to their reſpective demands, and time ſince each debt was contracted. D's is 250l. with 10 months intereſt, E's 160l. with 12 months intereſt, and F's 390l. with 6 months intereſt; what is each claimant's ſhare of the effects?—Anſ. D's ſhare 184l. 18s. $2\frac{1}{4}$ $\frac{336}{576}$d. E's ſhare 142l. 0s. $2\frac{1}{4}$ $\frac{244}{576}$d. F's ſhare 173l. 1s. $6\frac{1}{4}$ $\frac{572}{576}$d.

4. A perſon dying left 500l. to his three ſons, to be divided in proportion to their ages, and the time each ſhould refrain from getting drunk. John was 21 years old, and refrained 90 days; Thomas was 24 years old, and refrained 64 days; and James was 32 years old, and refrained 56 days. Find each perſon's ſhare of the money.—Anſ. John muſt receive 181l. 2s. $0\frac{3}{4}$ $\frac{1718}{2112}$d. Thomas muſt receive 147l. 3s. $7\frac{3}{4}$ $\frac{2640}{2112}$d. and James 171l. 14s. $3\frac{0}{4}$ $\frac{4008}{2112}$d.

5. Two merchants enter into partnerſhip for 18 months. A put into ſtock at firſt 200l. and at 8 months end he put in 100l. more, B put in at firſt 550l. and at 4 months end took out 140l. Now at the expiration of the time they find they have gained 526l; what is each man's juſt ſhare?—Anſ. A's ſhare is 192l. 19s. $0\frac{0}{4}$ $\frac{672}{1764}$d. and B's ſhare is 333l. 0s. $1\frac{1}{4}$ $\frac{588}{1764}$d.

6. A ſhip's company took a prize of 4000l. value, which they agree to divide among them, according to their pay and time they have been on board. Now the officers and midſhipmen have been on board 4 months, and the ſailors 3; the officers have 50s. a month, the midſhipmen 40s. and the ſailors 28s.; moreover there are 4 officers, 8 midſhipmen, and 120 ſailors. I demand each perſon's ſhare in the ſaid prize?

		£.	s.	d.
Anſ.	Each officer muſt have - - - -	65	15	$9\frac{1}{4}$
	Each midſhipman muſt have -	52	12	$7\frac{2}{4}$
	Each ſailor muſt have - - - - -	27	12	$7\frac{1}{4}$

7. Brown

7. Brown, Hilton, and Weddell make a joint ſtock for 12 months. Brown at firſt put in 20l., and 4 months after 20l. more; Hilton put in at firſt 30l., at the end of 3 months he put in 20l. more, and 2 months after that he put in 40l. more; Weddell put in at firſt 60l., and 5 months after he put in 10l. more, one month after which he took out 30l. During the 12 months they gained 50l.; how much of it muſt each have?

		£.	s.	d.
Anſ.	Brown muſt have	10	18	$6\frac{1}{4}\ \frac{49}{61}$
	Hilton - - - - -	22	8	$1\ \frac{12}{61}$
	Weddell - - - -	16	13	4

B A R T E R.

BARTER is the exchanging one commodity for another, and gives rules whereby traders may ſo proportion the price and quantity of their goods as that neither party may ſuſtain loſs.

C A S E I.

The price and quantity of one commodity being given, to find what quantity of another commodity, at a ſpecified price, will be equal to it.

R U L E.

Find the value of that commodity whoſe quantity is given, and then find what quantity of the other may be purchaſed with that money.

EX-

EXAMPLES.

1. How much cloth at 9s. 6d. per yard, muſt be given in barter for 12cwts. of treacle, at 3l. 11s. 8d. per cwt.?

cwt.	£.	s.	d.	cwts.		s.	d.	yd.	£.
As 1	: 3	11	8	: : 12	As 9	6	: 1	: :	43
		12				2			20
43	0	0	va. of the treacle		19				860
									2

yds. qs.
19)1720(90 2 2/19
171 Anſ.
..10
4
19)40(2
38
.2
19

2. How many buſhels of apples, at 2s. 4d. per buſhel, will purchaſe 3 pairs of oxen, at 10 guineas per pair?
Anſ. 270 bls.

3. How many reams of paper, at 15s. 4½d. per ream, muſt be given in barter for 135 webs of linen cloth, at 3l. 5s. 7d. per web? Anſ. 575 reams, 17 3/4 qs.

4. How much tobacco, at 4l. 11s. 8d. per cwt. is equal in value to 9¼ cwts. of ſnuff, at 3s. 8½d. per lb.?
Anſ. 44 cwts. 19 20/171 lbs.

5. How much rice, at 3½d. per lb. muſt be bartered for 6¼ cwts. of ſugar, at 3l. 13s. 2d. per cwt.?
Anſ. 13 cwts. 3 qrs. 27 6/7 lbs.

6. John has 535 yards of linen, at 2s. 7½d. per yard, which he barters with Thomas for ſerge, at 3s. 9d. per yard; how many yards muſt he receive?
Anſ. 374½ yards.

CASE

CASE II.

The price and quantity of one commodity being given, to balance the same with two or more commodities, or with one or more commodities and cash.

RULE.

Find the value of the given commodity as before; then deduct either the cash, or the value of one or more of the given commodities, out of that sum, and work for the commodity remaining, by the last rule.

EXAMPLES.

1. John buys of Thomas $8\frac{1}{4}$ cwts. of tobacco, at $6\frac{1}{4}$ guineas per cwt., and pays him down 31l. 10s. 6d. in cash, and the rest in raisins, at 3l. 10s. 8d. per cwt.; what quantity of raisins ought Thomas to receive?

gs.	£.	s.	d.	
$6\frac{1}{4}$=7	1	9		×$8\frac{1}{4}$
		8		
	56	14	0	
	1	15	$5\frac{1}{4}$	
	58	9	$5\frac{1}{4}$	the value of the tobacco
	31	10	6	cash paid
	26	18	$11\frac{1}{4}$	the value of the raisins

£.	s.	d.	cwt.	£.	s.	d.
As 3	10	8	: 1 : :	26	18	$11\frac{1}{4}$

20 — 20

70 — 538

12 — 12

848 — 6467

4 — 4

3392 — 3392)25869(7 cwts. 2 qrs. $14\frac{11}{113}$ lbs. Anſ.

23744

.2125

4 qrs.

3392)8500(2

6784

1716

28

13728

3432 lbs.

3392)48048(14

3392

14128

13568

..560 = $\frac{35}{113}$

3392

2. Joſeph has 120 yards of linen, at 2s. 3d. per yard, for which Richard gives him 20 lbs. of tea, at 5s. per lb. and the balance in wine, at 7s. 6d. per gallon. How much wine will make a balance?

Anſ. 22 gs. $2\frac{2}{3}$ qts.

3. John has 150 gallons of brandy, at 11s. 8d. per gallon, which he barters with Thomas for 25 guineas in caſh,

caſh, a writing deſk, valued at 7l. 10s. 6d., and a new hat valued at 2l. 5s. 6d.; and agrees to have board and lodging for the reſt, at 25 guineas a year; how many days board muſt he have? Anſ. 715 $\frac{3}{4}$ds.

4. Robert and Henry barter. Robert has 53 qrs. 5 bls. of wheat, at 1l. 10s. per quarter, for which Henry gives him 13 cwts. 16 lbs. of ſugar, at 4l. 12s. per cwt. and the balance in raiſins, at 6$\frac{1}{4}$d. per lb. How many lbs. of raiſins muſt be given?

Anſ. 737 $\frac{67}{91}$ lbs.

5. James has 1600 yards of cloth, at 1s. 5d. per yard, which he barters with William for raiſins, at 5d. per lb., and ſugar at 8d. per lb., and to have one third in money, and an equal quantity of raiſins and ſugar. How much money muſt he receive, and how many lbs. of each ſort of goods?

Anſ. 37l. 15s. 6$\frac{2}{3}$d. and 1394 $\frac{8}{19}$ lbs.

CASE III.

The rate of one commodity being given, to find how the other commodity is rated; the price of the firſt commodity, and the quantity of both commodities, being given alſo.

RULE.

Find the value of the firſt commodity, and then calculate the rate of the other commodity from that value and its quantity.

EXAMPLES.

1. If 72 yards of cloth be given for 15 cwts. 3 qrs. of ſugar, at 1l. 18s. per cwt.; what is the cloth rated at per yard?

cwt.	*£.*	*s.*	*cwts.*	*qs.*	*yds.*	*£.*	*s.*	*d.*	*yd.*
As 1	: 1	18	: : 15	3	As 72	: 29	18	6	: : 1
4	20		4			20			
4	38		63			598			
			38			12			
			504			72)7182(99			
			189			648			
			4)2394			702			
			20)598	6 *d.*		648			
						54			

£. 29 18 6 the value of 4 the tobacco

72)216($\frac{3}{4}$
216
...

(12)
s. 8 $3\frac{1}{4}$ Anſ.

2. John delivered 3 hhds. of brandy, at 6s. 8d. per gallon, to Edward for 126 yards of cloth; what was the cloth per yard? Anſ. 10s.

3. Robert gives Ralph 54 yards of broad cloth, at 18s. 6d. per yard, and $30\frac{1}{2}$ lbs of coffee, at 1s. 3d. per lb. for 137 ſtones $3\frac{1}{4}$ lbs. of figs; what are the figs per lb? Anſ. 6d.

4. What is cloth worth per yard, when 99 yds. of it are given in barter for a hhd. of geneva, at 6s. $1\frac{1}{2}$d. per gn? Anſ. 3s. $10\frac{3}{4}$ $\frac{1}{7}$d.

5. Abraham gives Benjamin 180 buſhels of wheat, at 6s. 9d. per buſhel, for which he receives 25l. 15s. in caſh, and a cow, valued at 5l.; he alſo pays David a bill on his account, amounting to 10l. 11s. 8d. and balances

balances Abraham's demand with 932 lbs. of treacle; what was the treacle valued at per lb.? Anſ. 5d.

C A S E IV.

To calculate the bartering price of any commodity, ſo that it may bear an equal advance to a given one made on another commodity

R U L E.

State,—as the ready money price of one commodity: is to its bartering price: : ſo is the ready money price of the other commodity: to its bartering price.

N O T E.

In calculating the quantity of any commodity, under this caſe, you may uſe either the ready money or bartering price.

E X A M P L E S.

1. John has cloth, at 3s. 4d. per yard, ready money, which he advances to 5s. per yard in barter for rum, worth 6s. 8d. per gn. in ready money. How much is the rum worth per gn. in barter, ſuppoſing it advanced in proportion to John's cloth?

	s.	d.		s.	d.
As	3	4	: 5 : :	6	8
	12			12	
	40			80	
				5	
				4,0)40,0	
				s. 10 Anſ.	

2. James has hops, at 3l. per cwt. ready money, but in bartering with Thomas for tea, worth 4s. 9d.

per lb. ready money, will have 3l. 10s. per cwt. ; what muſt the tea be raiſed to in barter, and how much of it given for $11\frac{1}{4}$ cwts. of hops?

Anſ. 5s. $6\frac{1}{4}$d. in barter, quantity $142\frac{6}{7}$ lbs.

3. John has cloth, worth 2s. 3d. per yard, ready money, but in barter will have 2s. 5d. Thomas has ſoft ſugar, which he, to be on a par with John, barters at 1s. 4d. per lb. What is the ready money value of Thomas's ſugar, and how much of it is worth 150 yards of John's cloth?—Anſ. 1s. $2\frac{1}{4}$ $\frac{1}{19}$d. in ready money, $271\frac{7}{8}$ lbs. muſt be given.

4. Edward and Jackſon barter. Edward has cloth worth 16s. per yard, which he barters at 18s. 6d. with Jackſon, for tea at 6s. per lb. which is worth only 5s. 4d. per lb. Whether has the advantage in barter, and how much tea muſt be given for 170 yards of cloth?—Anſ. Jackſon has the advantage, his tea being worth no more than 5s. $2\frac{1}{4}$ $\frac{9}{11}$d. per lb.—$524\frac{1}{8}$ lbs. muſt be given

REMARK.

There are ſome few queſtions in barter, which do not fall under any of the above caſes, but they may be eaſily ſolved by conſidering them attentively.

LOSS and GAIN,

LOSS and gain is a rule whereby traders eſtimate what gain or loſs they make by different commodities; it alſo teaches how to advance or lower the price of goods, ſo as to make a given gain or loſs by them.

CASE I.

To find the gain or loſs on any quantity of goods.

RULE.

RULE.

State,—as 1 lb. yard, gn, or bl. &c. : is to its gain or loſs : : ſo is the whole quantity of goods given : to their gain or loſs.—Or, it is ſometimes better to find the prime coſt of the goods, and the ſum they are ſold for, and take the difference for the gain or loſs.

EXAMPLES.

1. If I buy ſugar at $6\frac{1}{4}$d. per lb. and ſell it $8\frac{1}{4}$d. per lb.; what do I gain by $4\frac{1}{4}$ cwts.?

d.	*lb.*	*d.*	*cwts.*	*qr.*
$8\frac{1}{4}$	As 1 :	$2\frac{1}{2}$ ::	4	1
$6\frac{1}{4}$		4	4	
$2\frac{1}{2}$		10	17	
			28	
			136	
			34	
			476	
			10	
			4)4760	
			12)1190	
			2,0)99	2d.
			£. 4 19	2 Anſwer.

2. Bought 274 yards of cloth, at 2s. $1\frac{1}{4}$d. per yard, and ſold it at 2s. $4\frac{1}{4}$d. per yard; what did I gain by the bargain? Anſ. 3l. 14s. $2\frac{1}{2}$d.

3. Sold $211\frac{1}{2}$lbs. of muſtard, at $9\frac{1}{2}$d. per lb., which coſt me in all 6l. 17s. 6d.; how much did I gain or loſe by it? Anſ. 1l. 9s. $11\frac{3}{4}$d. gained.

4. Sold

4. Sold 10cwts. 2qrs. of hops, for 36l. 15s. which coſt 3l. 5s. 6d. per cwt.; what is the gain per cwt.?

Anſ. 4s. 6d.

5. Bought cloth at 2s. 4d. per ell Flemiſh, and ſold it at 2s. 7d. per yard; how much do I gain or loſe in 156 yards? Anſ. I loſe 4l. 2s. 4d.

6. Bought 19 fothers of lead, at 14s. per cwt.; what is gained by the whole, ſold out at 4d. per lb.?

Anſ. 432l. 5s.

7. If 5cwts. 3qrs. 14lbs. be bought for 9l. 8s. and ſold for 11l. 18s. 11d.; what is gained by 1cwt.?

Anſ. 8s. 8d.

8. Bought 600 eggs, half of them at 2 for a penny, and the other half at 3 for a penny, and ſold them all at 5 for two-pence; did I gain or loſe by them, and how much? Anſ. I loſt 10d.

CASE II.

To find the ſelling price of any quantity of goods, ſo as to gain or loſe a given ſum by a ſpecified quantity.

RULE.

Add the gain to, or ſubtract the loſs from, the prime coſt, and the ſum or difference will be the ſelling price of the whole quantity; after which you may find the ſelling price of any part of the quantity by the rule of three.

EX-

EXAMPLES.

1. If I give 23l. for 5 cwts. 1 qr. 18 lbs. of tobacco at what rate muſt I ſell it per lb. to gain 18 guineas by the whole?

£.	s.	d.	
23	0	0	the prime coſt
18	18	0	the gain to be made
41	18	0	the ſelling price of the whole.

cwts.	qrs.	lbs.		£.	s.		lb.
As 5	1	18	:	41	18	: :	1
4				20			
21				606)838(1	s. 4	d. $\frac{232}{606}$	Anſ.
28				606			
176				232			
43				12			
606				606)2784(4d.			
				2424			
				360			
				4			
				606)1440($\frac{2}{3}$			
				1212			
				.228			
				606			$=\frac{38}{101}$

2. If 4 cwts. 18 lbs. be bought for 26l. 10s. 6d.; at what rate per lb. ſhall I ſell it, to gain 15l. upon the whole? Anſ. 1s. $9\frac{1}{4}\frac{12}{23}\frac{7}{23}$d.

3. Bought a puncheon of rum, containing 84 gallons, for 7s. 6d. per gn.; but having loſt 16 gallons of it, by leakage, I would ſell the remainder ſo, as to make up the prime coſt of the whole; what muſt I ſell a gallon for? Anſ. 9s. $3\frac{1}{17}$d.

4. A

4. A draper bought 200 yards of broad cloth, for which he gave 112l.; I desire to know how he must sell it per yard to gain 38l. by the whole? Anſ. 15s.

5. If 2cwts. 1qr. 18lbs. be bought for 23l. 17s. 8d.; at what rate per lb. ſhall I ſell it, to loſe 9 guineas by the whole? Anſ. 1s. $0\frac{1}{4}\ \frac{43}{111}$d.

CASE III.

To find the gain or loſs per cent. on any quantity of goods.

RULE.

If the prime coſt is given,—ſtate,—as the prime coſt of any quantity of goods: is to the gain or loſs on that quantity: : ſo are 100 pounds: to the gain or loſs per cent. And, if two ſelling prices are given,—ſtate,—as the price whoſe gain per cent. is given: is to the ſum of 100 pounds and its gain, or the difference between 100 pounds and its loſs: : ſo is the other price given: to the value of 100 pounds worth of goods at that price. Then deduct 100 pounds from that value, and the remainder will be the anſwer.

EXAMPLES.

1. Bought cloth at 3s. per yard, and ſold it at 4s. 2d. per yard; what is the gain per cent.?

s.	d.
4	2
3	0
1	2

As

s.	:	s.	d.	£.
3	:	1	2	:: 100
		12		20
		14		2000
				14

3)28000

12)9333$\frac{1}{4}$ $\frac{1}{3}$

2,0)777 9$\frac{1}{4}$ $\frac{1}{3}$

Anſ. 38 17 9$\frac{1}{4}$ $\frac{1}{3}$

3. If

2. If I gain 6l. 10s. per cent. by selling cloth at 15s. 9d. per yard; what would I gain per cent. by selling the same at 18s. 6d. per yard?

£.	s.		s.	d.		£.	s.		s.	d.
6	10	As	15	9	:	106	10	: :	18	6
100			12			20			12	
106	10		189			2130			222	
						222				

426
426
426

189)472860(250,1
378
948
945
360
189
171
12

189)2052(10d.
189
162
4

189)648($\frac{3}{7}$
567
81
189

2,0

125	1	$10\frac{3}{4}$	$\frac{1}{7}$
100	0	0	

£. 25 1 $10\frac{3}{4}$ $\frac{1}{7}$ Anſ.

5. If

3. If I buy tea at 8s. 6d. per lb. and ſell it again at 10s. 6d. per lb.; what is the gain per cent.?

Anſ. 23l. 10s. $7\frac{1}{11}$d.

4. By ſelling at 4d. per lb. I gain 10 per cent.; what do I gain or loſe per cent. by ſelling at $3\frac{1}{2}$ per lb.

Anſ. I loſe 3l. 15s. per cent.

5. What do I loſe per cent. when I loſe $2\frac{1}{2}$d. in a ſhilling. Anſ. 20l. 16s. 8d.

6. Bought goods at $4\frac{1}{2}$d. per lb. and ſold them at 2l. 8s. 4d. per cwt.; what gain do I make per cent.?

Anſ. 15l. 1s. $7\frac{1}{11}$d.

7. If, when I ſell cloth at 7s. per yard, I gain 10 per cent.; what is the gain or loſs per cent. when it is ſold at 6s. per yard? Anſ. 5l. 14s. $3\frac{1}{11}$d. loſs.

8. What do I gain or loſe per cent. by ſelling goods at $2\frac{1}{4}$d. per lb. which coſt me 12s. 8d. per cwt. and 1s. 8d. per cwt. carriage, alſo $10\frac{1}{2}$d. per cwt. for warehouſe room? Anſ. 38l. 1s. $7\frac{1}{2}\frac{6}{7}\frac{6}{3}$d.

9. If I ſell 500 deals at 25d. each, and 9 per cent. loſs; what do I loſe by the whole quantity?

Anſ. 3l. 1s. $9\frac{3}{4}\frac{6}{1\,8\frac{1}{2}}$d.

10. Bought 20 gallons of brandy at 3s. per gallon, but by accident 3 gallons of it are loſt; at what rate muſt I ſell the remainder per gallon, and gain upon the whole prime coſt, at the rate of 10 per cent?

Anſ. 3s. $10\frac{1}{2}$d.

CASE IV.

To find the prime coſt of any quantity of goods.

RULE.

Calculate the whole gain or loſs, by the rules already given, and then add the gain to, or ſubtract the loſs from, the ſelling price, and the ſum or difference will be the anſwer.

F. X.

EXAMPLES.

1. I sold 60 yards of cloth for 45l. 2s. and gained 10 per cent. by so doing. What was the prime cost of the cloth per yard?

£.	£.	£.	s.
As 110 :	100 ::	45	2
		20	
		902	
		100	
2200		902,00	

22,00)902,00(41l. the prime cost
88 of the whole.
22
22

yd.	£.	yd.
As 60 :	41 ::	1
		20
		820

6,0)82,0

Ans. 13s. 8d.

2. If 12 yards of cloth be sold for 5l. 14s. and 8 per cent. be gained by so doing; what was the prime cost of a yard? Ans. 8s. $9\frac{1}{2}$ $\frac{2}{9}$d.

3. I sold sugar at 3l. 15s. per cwt. and by so doing I lost 5l. 10s. a ton; what did one cwt. cost me?

Ans. 4l. 0s. 6d.

4. Sold a repeating watch for 50 guineas, and by so doing lost 17 per cent. whereas I ought in dealing to have cleared 20 per cent.; how much was it sold under its just value? Ans. 23l. 8s. $0\frac{3}{4}$ $\frac{1}{6}$ $\frac{5}{3}$d.

5. Sold a quantity of hops for 21l. 15s. more than they cost me, so that my gain was 25 per cent.; what was the prime cost of the hops? Ans. 87l.

ALLIGATION.

ALLIGATION teacheth how to mix ſeveral ſimples of different qualities together, ſo that the compound may be of a middle quality, and is of two kinds *alligation medial*, and *alligation alternate*.

ALLIGATION MEDIAL.

ALLIGATION medial is when the price and quantity of ſeveral commodities are given, to find the mean price of a mixture made up of them all.

RULE.

Multiply each quantity by its price; then divide the ſum of the products by the ſum of the quantities, and the quotient will be the anſwer.

PROOF.

Find the value of the whole mixture at the mean price, and if it agrees with the total value of the ſeveral quantities, at their reſpective prices, the work is right.

EXAMPLES.

1. A grocer mixed 2 cwts. of ſugar, at 56s. per cwt., with 1 cwt. at 43s. per cwt., and 2 cwts. at 50s. per cwt.; what is a cwt. of this mixture worth?

cwts.	*s.*	*s.*
2 ×	56 =	112
1 ×	43 =	43
2 ×	50 =	100
5		5)255 total value
		s. 51 Anſ.

cwt.	*s.*	*cwts.*
As 1	: 51	:: 5
	5	
	255	Proof

2. I

2. I mixed together 17 gallons of ale, at 9d. per gallon, 14 at 7½, 5 at 9½d. and 21 at 4½. How much per gallon is the mixture worth? Anſ. 7 $\frac{1}{17}$d.

3. A compoſition is made of 10 lbs. of tea, at 7s. per lb., 18 lbs. at 8s. 6d. per lb., and 29 lbs. at 5s. 10d. per lb.; what is a lb. of it worth? Anſ. 6s. 10$\frac{1}{2}$ $\frac{14}{17}$d.

4. With 7 ozs. of gold, of 22 carats fine, I mixed 12½ ozs. of 21 carats fine, and 17 ozs. of 19 carats fine; required the fineneſs of this compoſition?

Anſ. 20 $\frac{10}{17}$ carrats fine.

5. With 13 gs. of burgundy, at 6s. 8d. a gn. and 20 galls. of mountain, at 5s. a gn. I mixed 14 gs. of port, at 7s. 6d. a gn. 15 gs. of cyder, at 1s. 4d. a gn. and 20 gallons of water. How muſt I ſell a gallon of this mixture, ſo as to clear 25 per cent?

Anſ. 4s. 9 $\frac{1}{11}$d.

ALLIGATION ALTERNATE.

ALLIGATION alternate is, when the prices of ſeveral commodities are given, to find what quantity of each muſt be taken to compoſe a mixture worth a given price.

NOTE.

1ſt. Many of the queſtions in this rule admit of a great variety of anſwers, by linking the prices in a different manner, and by multiplying or dividing the quantities firſt found by any number you pleaſe.

2d. The operations are proved by alligation medial.

CASE I.

When the compoſition is not limited to a certain quantity.

RULE.

Write the prices in a column one under another, and the mean rate or price on the left-hand of them. Then, link the prices together in ſuch a manner that every

one leſs than the mean rate be linked with ſome one greater; and every one that is greater with a leſs one, or with as many leſs as you pleaſe. This done, place the difference between the prices and the mean rate oppoſite to the prices they are linked to, changing each difference to the contrary end of the linking; and if only one difference ſtand againſt any price, it will be the anſwer required; but if ſeveral differences ſtand againſt any price, their ſum will be the anſwer.

EXAMPLES.

1. A grocer has ſeveral ſorts of tea, worth 12s. 11s. 9s. and 8s. per lb.; how much of each ſort muſt he take to make a mixture worth 10s. per lb.?

		Anſ.	*s.*	*s.*
10	12	1 at	12 =	12
	11	2 at	11 =	22
	9	2 at	9 =	18
	8	1 at	8 =	8
		6		6)60

Or thus.

		Anſ.	*s.*
10	12	2 at	12.
	11	1 at	11.
	9	1 at	9.
	8	1 at	8.

Proof 10 in the mean rate.

2. How much wine at 8s. 7s. 6s. and 4s. per gallon, muſt be mixed together, that the compoſition may be worth 5s. per gallon?—Anſ. 1 gn. at 8s. 7s. and 6s. per gn. and 6 gns. at 4s. per gn.

3. How much corn at 2s. 6d. at 3s. 8d. at 4s. and at 4s. 8d. per buſhel, muſt be mixed together, that the mixture may be worth 3s. 10d. per buſhel?—Anſ. 10 bls. at 2s. 6d. 2 bls. at 3s. 8d. 2 bls. at 4s. and 16 bls. at 4s. 8d. per bl.

4. I would mix ſugars at 11d. 9d. and 7d. per lb. together. How much of each ſort muſt I take that the compound may be worth 8½d. per lb?—Anſ. 6 lbs. at 11d. per lb. 6 lbs. at 9d. per lb. and 12 lbs. at 7d. per lb.

5. A tobacconiſt has tobaccos at 2s. 6d. 1s. 8d. 1s. 6d. and 1s. 3d. per lb.; what quantity of each ſort muſt he take to make a mixture worth 2s. per lb?—Anſ. 19 lbs. at 2s. 6d. per lb. and 6 lbs. of each of the other ſorts.

6. A ſpirit-merchant mixes brandies at 8s. 7s. 6s. and 4s. per gn. and water at 0s. per gn. together. How much of each article muſt he take to make a mixture worth 5s. per gn.?—Anſ. 5 gs. at 8s per gn. 5 gs. at 7s. per gn. 1 gn. at 6s. per gn. 1 gn. at 4s. per gn. and 5 gns. of water.

CASE II.

When the whole compoſition is limited to a certain quantity.

RULE.

Take the difference between each price and the mean rate as in the laſt caſe. Then ſtate,—as the ſum of the differences: is the whole quantity of the compound: : ſo is each particular difference: to its particular quantity.

EXAMPLES

1. I have teas at 5s. 6s. 8s. and 9s. per lb. and I would make a mixture of 84 lbs. worth 7s. per lb.; in what proportion muſt thoſe teas be taken?

			lbs.	*lbs.*	*lbs.*	*s.*	*s.*
7	5	1	As 6 : 84 : : 1 : 14	Anſ.	14 at 5	=	70
	6	2	As 6 : 84 : : 2 : 28		28 at 6	=	168
	8	2	As 6 : 84 : : 2 : 28		28 at 8	=	224
	9	1	As 6 : 84 : : 1 : 14		14 at 9	=	126
		6			84		*s.* 588 (7 Pr.
							588
							...

1. A brewer hath ale at 10d. at 8d. and at 6d. per gallon, and would make a compoſition of 30 gallons, worth 7d. per gn. How much of each ſort muſt he have?—Anſ. 5 gs. at 10d. per gn. 5 gs. at 8d. per gn. and 20 gs at 6d. per gn.

3. James Watſon has raiſins at 4d. 6d. 9d. and 11d. per lb. and he would make a mixture of 60 lbs. worth 8d. per lb.; how much of each ſort muſt he take?—Anſ. 18 lbs. at 4d. per lb. 6 lbs. at 6d. per lb. 12 lbs. at 9d. per lb. and 24 lbs. at 11d. per lb.

4. A goldſmith has gold at 24, 22, and 18 caracts fine, and he would mix 120 ozs. of 20 caracts fine; how much of each ſort muſt he take?—Anſ. 24 ozs. at 24 cts. 24 ozs. at 22 cts. and 72 ozs. at 18 cts. fine.

CASE III.

When one of the ingredients is limited to a certain quantity.

RULE.

Take the difference between each price and the mean rate as before. Then ſtate,—as the difference of that commodity whoſe quantity is given: is to the known quantity: : ſo are the other differences ſeparately: to their reſpective quantities.

EXAMPLES.

1. How much tea at 6s. 5s. and 3s. per lb. muſt be mixed with 40 lbs. at 2s. per lb. to make a compoſition worth 4s. per lb.

			lbs.	s.	s.
2 —	1		40	at 2	= 80
4 { 6 —	1	As 1 : 40 : : 1 : 40	at 6	=240	
5 —	2	As 1 : 40 : : 2 : 80	at 5	=400	
3 —	2	As 1 : 40 : : 2 : 80	at 3	=240	
			240	240	960

960(4 Proof
960
...

2. How

2. How much rum at 2s. 6d. 2s. 9d. and 3s. a bottle, muſt be mixed with 9 bottles at 2s. a bottle, that the mixture may be worth 2s. 8d. a bottle?—Anſ 36 bottles, at 2s. 6d. a bot. 72 bottles at 2s. 9d. a bot. and 18 bottles at 3s. a bottle.

3. John Grocer has 88 lbs. of tobacco, worth 30d. per lb. which he would mix with other tobaccos worth 20d. 18d. and 15d. per lb. ſo that the mixture may be worth 24d. per lb. What will this parcel weigh?

Anſ. 74 lbs.

4. How much gold of 23, 21, 18, and 17 carats fine, muſt be mixed with 12 ounces of 19 carats fine, to make a compound worth 20 carats fine?—Anſ. 18 ozs. of 23 cts. fine, 18 ozs. of 21 cts. fine, 12 ozs. of 18 cts. fine, and 12 ozs. of 17 cts. fine.

5. A grocer mixes 40 lbs. of ſugar, at 10d. per lb. with other ſugars, at 7½d. 5d. and 4½d. per lb. I demand the weight of a compound made of theſe ſugars that may be worth 6d. per lb.? Anſ. 320 lbs.

REMARK.

When two or more ingredients are limited to a certain quantity, the rule is the ſame, only you muſt firſt find for one limitation, and then for another.

EXCHANGE.

EXCHANGE is the bartering the money of one place for that of another, and is principally uſed to find what quantity of one kind of money will be equal to a propoſed quantity of another.

The

The par of exchange is that ſum of the money of one place which is intrinſically equal to a certain ſum in another place, and never varies.

The courſe of exchange is that ſum of the money of one place which is given for a certain ſum in another place when the exchange is made, and is conſtantly varying.

The agio is the difference between the bank and current money of any place, and is always in favour of the bank money.

NOTE.

1ſt. The money uſed in exchange is frequently imaginary, and differs widely, in many places, from the money in which they keep their accounts; and it is alſo different, in ſome places, from both the current and bank money in uſe among them,

2d. Queſtions in exchange are performed either by the rule of three, or the rules of practice.

I. WITH IRELAND.

In Ireland accounts are kept in pounds, ſhillings and pence Iriſh.

The par of exchange is 108l. 6s. 8d. Iriſh for 100l. ſterling, or 1l. 1s. 8d. Iriſh per pound ſterling.

The courſe of exchange is from 5 to 12 per cent. according as the balance of trade favours Ireland or England.

EX-

EXAMPLES.

1. Dublin remits to London 875l. 10s. 6d. Irish; what is the value here, exchange at 109¼ per cent?

£.	s.		£.		£.	s.	d.
As 109	5	:	100	::	875	10	6
20					20		
2185					17510		
12					12		
26220					210126		
					100		

2622,0)2101260,0(801 £. 7 s. 11 d. 10/21 Ans.
20976

...3660
2622

1038
20

2622)20760(7s.
18354

.2406
12

2622)28872(11d.
2622

.2652
2622

..30
2622

2. London

2. London remits to Dublin 751l. 10s. ſterling; how much Iriſh money muſt be received there, exchange at 10 per cent? Anſ. 826l. 13s.

3. I have lately purchaſed in Ireland effects to the value of 400l. 17s. 9d. Iriſh; how much money muſt I pay in London to ſettle this account, ex. at 10 per cent. Anſ. 364l. 8s. $10\frac{1}{4}\ \frac{5}{11}$d.

4. London remits to Ireland 651l. 14s. $11\frac{1}{2}$d. ſterling; for how much Iriſh muſt London be credited, exchange at 12 per cent? Anſ. 729l. 19s. $2\ \frac{1}{11}$d.

II. With AMERICA and the WEST INDIES.

In the American colonies, and in the Weſt Indies, accounts are commonly kept in pounds, ſhillings and pence as in England. Their money is called *currency*, and it bears a diſcount of from 30 to 50 per cent. in the courſe of trading with us.

EXAMPLES.

1. I bought goods at Jamaica to the amount of 176l. 12s. 8d. ſterling; how much is that in their currency, exchange at 25 per cent.?

£.		£.	s.	d.
25	$\frac{1}{4}$	176	12	8
		44	3	2
		220	15	10 Anſ.

2. Suppoſe a merchant has owing to him in America 420l. 9s. 6d.; what is it worth in ſterling money, exchange at $145\frac{3}{4}$ currency per cent.?

Anſ. 288l. 9s. $9\frac{1}{2}\ \frac{1650}{1749}$d.

3. America

3. America is indebted to England 287l. 19s. 9d. ſterling; with how much currency will England be credited in America, exchange at $33\frac{1}{3}$ per cent.

Anſ. 384l. 9s. $3\frac{19}{20}$d.

4. Jamaica remits to Liverpool for 287l. 0s. $10\frac{1}{4}$d. currency; what muſt be received for it, exchange at 135 per cent. Anſ. 212l. 12s. 6d.

III. With FRANCE.

In France, accounts are kept in livres, ſols and deniers, and they exchange with England upon the crown Tournois.

The par of exchange is 2s. $5\frac{1}{4}$d. nearly for one ecu or crown, and *the courſe of exchange* is from 30 to 40 pence ſterling for the ſame.

NOTE.

The French diſtinguiſh their money by the word Tournois, as we do ours by the word ſterling.

12 deniers	make one	ſol
20 ſols		livre
3 livres		ecu or crown
10 livres		piſtole
24 livres		louis d'or, or guinea

EX-

EXAMPLES.

1. What is the ſterling value of 215 crowns, 1 livre, 12 ſols French, exchange at $33\frac{1}{4}$d. per ecu Tournois?

cr.	*d.*		*crs. liv. ſols.*
As 1	$33\frac{1}{4}$	::	215 1 12
3	4		3
3	133		646
20			20
60			12932
			133
			38796
			38796
			12932
			6,0)171995,6
			4)28665-$\frac{6}{60}$=$\frac{4}{5}$
			12)7166$\frac{1}{4}$
			2,0)59,7 $2\frac{1}{4}$
			£. 29 17 $2\frac{1}{4}$ $\frac{14}{15}$ Anſ.

2. How many livres, &c. will 243l. 17s. amount to, exchange at $32\frac{7}{8}$d. per ecu Tournois?

Anſ. 5340 livs. 11 ſols. 10 $\frac{84}{263}$ dens.

3. How much ſterling money is equal to 366 livres, 6 ſols, $11\frac{1}{2}$ dens. Tournois, exchange at 2s. $7\frac{1}{4}$d. per crown? Anſ. 15l. 18s. 0 $\frac{14}{288}$d.

4. Reduce 1921. 19s. $4\frac{1}{2}$d. ſterling into French piſtoles, exchange at $31\frac{1}{8}$d. per crown.

Anſ. 442 ps. 8 livs. 5 ss. 8 $\frac{212}{251}$ ds.

5. Paris

5. Paris draws on London for 15380 livres, exchange at $33\frac{1}{8}$d. per crown; how much ſterling will clear the draught? Anſ. 707l. 11s. $8\frac{1}{4}\frac{3}{7}$d.

6. How much ſterling is equal to 320 crowns, 6 ſols, 4 dens., exchange at $31\frac{5}{8}$d. per crown?

Anſ. 42l. 1s. $9\frac{44}{461}$d

IV. With SPAIN.

They have two kinds of money in Spain, called *plate* and *vellon*. The plate is of good ſilver, and its value is fixed. The vellon is adulterated with copper, and its value is variable, but it is generally about 20 per cent. worſe than the plate money.

In ſome parts of Spain, accounts are kept in rials and marvadies vellon, and they exchange upon the ducat of 375 marvadies. But, in general, they keep their accounts in piaſtres, rials, and marvadies plate, and exchange upon the piaſtre, which is worth 3s. 7d. at *par*, and which goes for from 35 to 45 pence ſterling, in the courſe of exchange.

4 marvadies vellon, or $2\frac{1}{2}$ marvadies plate	make one	quarta
34 marvadies vellon, or $8\frac{1}{2}$ quartas	make one	rial vellon
34 marvadies plate, or 16 quartas	make one	rial of plate
8 rials of plate	make one	piaſtre, piece of eight or dollar
5 piaſtres	make one	Spaniſh piſtole
2 piſtoles	make one	doubloon

EXAMPLES.

1. How many piaſtres ſhall I receive in Spain for 375l. 11s. 8d. ſterling, exchange at 42½d. per piaſtre?

d. *p.* *l.* *s.* *d.*
As 42½ :: 1 :: 375 11 8

4 20

170 7511

12

90140

4

ps. *rs.* *ms.*
17,0)360560(2120 7 18 Anſ.

34

20 9

17 34

ms.
35 17)306(18

34 17

16 136

8 136

rs. ...
17)128(7

119

9

2. How much ſterling is equal to 1387 piaſtres, 1r. 13 ms. exchange at 44½d. per piaſtre?

Anſ. 254l. 19s. $1\frac{1}{2}\frac{5}{6}\frac{7}{12}$d.

3. Spain draws on England for 3542 pias. 4rs. 17ms. exchange at 3s. 2½d. ſterling per piaſtre; how much money much muſt be paid in England?

Anſ. 568l. 5s. $8\frac{1}{2}\frac{8}{12}\frac{5}{10}$d.

4. Reduce 2189 rials vellon into rials plate.

Anſ. 1162rs. pl. 14½qts.

5. England is indebted to Spain 1000 pounds ſterling; how many rials vellon will it come to, exchange at 3s. 1½d. ſterling per piaſtre? Anſ. 96376rs. vn. 16ms.

6. Find

6. Find how much ſterling is equal to 5861 quartas exchange at 39¼d. per piaſtre.

Anſ. 7l. 10s. $5\frac{1}{4}\ \frac{1}{1}\frac{1}{1}\frac{1}{1}$d.

7. Reduce 1218 pias. 3 rs. pl. 2 qrs. into ſterling, exchange at 3s. 8¾d. per piaſtre.

Anſ. 227l. 3s. $6\frac{3}{4}\ \frac{1}{0}\frac{9}{4}$d.

V. With PORTUGAL.

Accounts are kept in Portugal in reas and milreas, and they exchange upon the milrea at from 60 to 68 pence ſterling. Its value at *par* is 5s. 7½d.

400 reas, 1000 reas } make one { cruſadoe, milrea

EXAMPLES.

1. To how much ſterling will 1218 milreas amount, exchange at 5s. 7¼d. per milrea?

	m.	s.	d.		ms.
As	1	: 5	7¼	: :	1218
		12			269
		67			10962
		4			7308
		269			2436
					4)327642
					12)81910½
					20)6826,5 10½
					£. 341 5 10½ Anſ.

2. What is the value of 375l. 7s. 6d. ſterling in milreas, &c. exchange at 65⅛d. per milrea?

Anſ. 1383ms. $339\frac{1}{7}\ \frac{8}{1}\frac{1}{1}$rs.

3. In 1861. 10s. 8d. ſterling, how many milreas, exchange at 5s. $4\frac{1}{4}$d. per milrea?

Anſ. 696 ms. $778\frac{64}{221}$ rs.

4. Reduce 3812 cruſadoes, 121 reas, to ſterling, exchange at $67\frac{1}{16}$d. per milrea?

Anſ. 427l. 8s. $9\frac{1}{4}\ \frac{104}{177}$d.

5. How many milreas, &c. muſt be given for 414l. 11s. 9d. ſterling, exchange at 5s. $3\frac{1}{2}$d. per milrea?

Anſ. 1566 ms. $944\frac{113}{127}$ rs.

VI. With HOLLAND, FLANDERS, and GERMANY.

In Holland, Flanders and Germany, accounts are kept either in pounds, ſhillings and pence Flemiſh, or in guilders, ſtivers and pennings.

There are two ſorts of money in theſe countries, called *bank-money* and *current*. The difference between them is from 3 to 6 per cent. which is always in favour of the bank-money.

The par of exchange is one pound ſterling for 1l. 16s. 7d. Flemiſh, and *the courſe of exchange* is from 33 to 38 ſhillings Flemiſh per pound ſterling.

8 pennings	make one	grote or penny
2 grotes		ſtiver
6 ſtivers		ſchilling
20 ſtivers or 40 pence		guilder or florin
$2\frac{1}{2}$ guilders		rix-dollar
6 guilders		pound Flemiſh

N O T E.

1ſt. Bank-money may be turned into current, and the contrary, by theſe proportions, viz.—as 100 : is to 100 with the agio added to it : : ſo is any given ſum banco : to the current required;—and,—as 100 with the agio added to it : is to 100 : : ſo is any given ſum current : to its value in bank-money.

2d. Bills on Holland, &c. are always drawn in bank-money.

EX-

EXAMPLES.

1. What may I draw my bill for in London, if I pay at Antwerp 4200 guilders, 12 ſts. 8 pennings, exchange, at 33s. 4d. Flem. per pound ſterling.

	s.	d.	£.		g's.	ſts.	ps.
As	33	4	: 1	: :	4200	12	8
	12				20		
	400				84012		
					2		
					4,00)1680,25		
					£. 420	1	3 Anſ.

2. Change 141l. 1s. 8½d. ſterling into guilders, &c., exhange at 33s. 3d. Flemiſh per pound ſterling.
Anſ. 1491 gls. 19 ſts. 15 pgs.

3. How many guilders may I have for 173l. 14s. 2d. ſterling, exchange at 35s. 6½d. Flemiſh per pound ſterling? Anſ. 1852 gs. 3 ſts. 4⅝ pgs.

4. Change 1718 guilders, 11 ſts. 15 pgs. into ſterling, exchange at 35s. 2¼d. per pound ſterling.
Anſ. 162l. 16s. $0\frac{3}{4}\ \frac{9}{10}\ \frac{1}{20}$d.

5. How much ſterling is equal to 264l. 9s. 10½d. Flemiſh, exchange at 33s. 8d. per pound ſterling?
Anſ. 157l. 2s. 6d.

6. A merchant received 250l. at London, for 2400 florins due at Rotterdam; what was the rate of exchange?
Anſ. 32s. Flem. per pound ſterling.

7. Change 2281. 4s. ſterling into rix-dollars current, exchange at 36s. 1½d. Flemiſh per pound ſterling, and agio 4⅛ per cent.
Anſ. 1034 rix-ds. 2 ſs. 9 ſts. 15 pgs.

8. A merchant in Holland owes in England 1562 florins currency; what will it come to in ſterling, at 34s. banco per pound ſterling, agio 6 per cent.?

Anſ. 144l. 0s. 1½d.

9. What quantity of Flemiſh currency muſt I have for 145l. 5s. 11d. ſterling, exchange at 33s. 10d. Flemiſh per pound ſterling, and agio at 4½ per cent.?

Anſ. 256l. 17s. $0\frac{1}{2}\frac{141}{1000}$d.

VII. With HAMBURGH.

At Hamburgh accounts are kept in marks, ſchillings lub and phennings, and they exchange by the pound Flemiſh as in Holland.

The par of exchange is 35s. 6⅔d. Flemiſh for one pound ſterling; *the courſe of exchange* is one pound ſterling for from 32 to 35 ſhillings Flemiſh; and the *agio* is from 18 to 30 per cent.

12	phennings or deniers	make one	ſchilling lub, or 2 pence, or grotes Flemiſh
6	ſchillings lub		ſchilling groſs
16	ſchillings lub		mark, or 32 pence or grotes Flemiſh
2	marks		dollar or drittle
3	marks		rix-dollar
6¼	marks		ducat
7½	marks		pound Flemiſh, or livre groſs

EX-

EXAMPLES.

1. How many marks muſt be received at Hamburgh for 75l. ſterling, exchange at 35s. 3d. Flemiſh per pound ſterling? £. s. d. £.

As 1 : 35 3 :: 75

12

423

75

2115

2961

marks ſcs. l.

32)31725(991 6½ Anſ.

288

292

288

45

32

13

16

78

13

ſcs.

32)208(6½

192

16

½

32

2. In 1021 rix-dollars 39⅓ ſchillings lub, how many pounds ſterling, exchange at 32 ſchillings groſs 8 dens. per pound ſterling? Anſ. 250l. 4s. 10¼ 1/49d.

3. How much ſterling money will a bill of 3965 marks 10 ſchillings lub amount to, exchange at 35s. 3d. Flemiſh per pound ſterling? Anſ. 300l.

4. How

4. How many marks muſt be received for 268l. ſterling, exchange at 36s. 4d. Flemiſh per pound ſterling? Anſ. 3651½ ms.

5. In 3459 marks, 10 ſchillings lub; how many pounds ſterling, exchange at 36 ſchillings gros. 1 den. per pound ſterling, and agio 19¼ per cent.?
Anſ. 214l. 8s. 0¼d.

VIII. With ITALY.

At Genoa and Leghorn they keep their accounts in piaſtres or pezzos, ſoldi and denari (but ſome keep them in lires, ſoldi and denari) and they exchange by the piaſtre or pezzo, which is equal to 4s. 6d. *at par*.

The courſe of exchange is from 47 to 58 pence ſterling per piaſtre or pezzo.

12 denari, 20 ſoldi } make one { ſoldi, piaſtre or pezzo.

ALSO

12 denari, 20 ſoldi } make one { ſoldi, lire

NOTE.

At Genoa the pezzo of exchange is equal to 5¼ lires, conſequently exchange money is 5¼ times better than the lire money; and at Leghorn the piaſtre conſiſts of 6 lires, and 20 ſoldi make one lire, conſequently exchange money here is 6 times better than lire money.

EXAMPLES.

1. In 139l. 18s. 10½d. ſterling, how many piaſtres of Genoa, exchange at 47 ⅜d. per piaſtre?

d.	p.	£.	s.	d.
As 47 ⅜	: 1 : :	139	18	10 ½
8		20		
379		2798		
		12		
		33586		
		4		
		134346		
		2		
		379)268692(	708	18 11 $\frac{16}{379}$ Anſ.
		2653		
		3392		
		3032		
		360		
		20		
		379)7200(	18	ſs.
		379		
		3410		
		3032		
		378		
		12		
		379)4536(	11	ds.
		379		
		746		
		379		
		367		
		379		

2. How

2. How much ſterling money is equal to 1695 pezzos, 8 ſoldi of Genoa, exchange at 51 $\frac{7}{8}$d. ſterling per pezzo?
Anſ. 366l. 9s. $0\frac{3}{4}$ $\frac{1}{4}$d.

3. A merchant at London has credit at Genoa for 500 piaſtres; how much ſterling muſt he value for there, at 46 $\frac{1}{4}$d. per piaſtre? Anſ. 96l. 7s. 1d.

5. If I pay in London 375l. 13s. ſterling, for how many piaſtres, &c. may I draw my bill to be paid at Leghorn, exchange at 4s. 5d. per piaſtre?
Anſ. 1701 piaſs. 1 ſol. 1 $\frac{1}{4}$ den.

5. Reduce 1417 piaſs. 2 ſols. 10 dens. of Genoa into ſterling, exchange at 52$\frac{1}{4}$d. per piaſtre?
Anſ. 309l. 19s. 11$\frac{3}{4}$d.

6. London draws on Leghorn for 250l. ſterling, exchange at 3s. 10d. per piaſtre; how much lire money will anſwer the bill? Anſ. 7826 lrs. 1 ſol. 8 $\frac{10}{19}$ dens.

XI. With VENICE.

At Venice accounts are generally kept in ducats, ſols, and deniers, and they exchange by the ducat banco which is equal to 4s. 4d. *at par.*

The courſe of exchange is from 45 to 55 pence ſterling per ducat.

12 deniers d'or, 20 ſols d'or } make one { ſol d'or, ducat

NOTE.

1ſt. They have three ſorts of money at Venice, the *picoli*, the *banco current* and the *banco*. The *picoli* is 20 per cent. worſe than the *banco current*, and the *banco current* is 20 per cent. worſe than the *banco*.

2d. There is a bank at Venice where accounts are kept in ducats, groſs, and ſoldi, of 5 $\frac{1}{5}$ ſoldi to the groſs, and 24 groſs to the ducat.

EX-

EXAMPLES.

1. How much ſterling money is equal to 729 ducats, 19 ſols, 1 den. banco money of Venice, exchange at 4s. $4\frac{3}{4}$d. ſterling per ducat?

d.	s.	d.		dts.	su.	d.
As 1	: 4	$4\frac{3}{4}$	::	729	19	1
20	12			20		
20	52			14599		
12	4			12		
240	211			175189		
				211		
				175189		
				175189		
				350378		
				24,0)3696487,9(154020		(4)
				24		
				129		12)38565
				120		2,0)3208 9
				..96		£. 160 8 $9\frac{9}{4}\frac{79}{246}$
				96		Anſ.
				..48		
				48		
				..79		
				240		

2. How

2. How many ducats banco at Venice are equal to 771l. 5s. 0d. sterling, exchange at 52d. sterling per ducat?
Anſ. 3559 dts. 12 ss. 3 $\frac{9}{11}$ds.

3. In 1596 ducats, 13 ſols, 1 dr. banco current at Venice, how many pounds ſterling, exchange at 49d. per ducat banco, and agio 20 per cent.?
Anſ. 271l. 13s. 0$\frac{1}{2}$d.

4. London remits to Venice 325l. ſterling, exchange at 4s. 2d. per ducat banco; how many ducats banco will be received at Venice? Anſ. 1560.

X. With POLAND and PRUSSIA.

At Dantzick and Koningſberg accounts are kept in florins, groſs and penins, and they exchange by the groſs, 270 of which are ſuppoſed equal to one pound Flemiſh, and 110 to a rix-dollar at Hamburgh.

The courſe of exchange is from 240 to 295 groſs per pound Flemiſh.

6 penins	make one	ſhelon
18 penins		gros
18 gros		ort
30 gros		Poliſh guilder or florin
3 florins, or 90 gros		rix-dollar
6 florins		ducat

EX-

EXAMPLES.

1. In 2181. 18s. 8d. sterling, how many Polish rix-dollars, exchange 290 Polish gros per pound Flemish, and 34s. 4d. Flemish per pound sterling?

s.	d.		£.	s.	d.
10	0	½	218	18	8
4	0	⅕	109	9	4
0	4	1/12	43	15	8¾
			3	12	11¼
			375	16	8½

As 1 : 290 :: 375 16 8½

£. p. gs. £. s. d.

20 20

7516

12 12

240 90200

4 4

960 360802

290

3247218

721604

9,0

96,0)10463258,0(10899,2

96

Anf. 1211 2 4⅞

r. ds. gs. ps.

.863

768

.952

864

.885

864

.218

192

.26

18

208

26

96)468(4 ds.

384

.84

=⅞

96

2. Change 1170 florins into ſterling money, 270 Poliſh gros being equal to one pound Flemiſh, and 33s. 4d. Flemiſh to one pound ſterling. Anſ. 781.

3. In 756 gold ducats, how much ſterling money, exchange 280 Poliſh gros per pound Flemiſh, and 35s. 5d. Flemiſh per pound ſterling?

Anſ 274l. 8s. $11\frac{1}{4}\frac{3}{7}$d.

4. Reduce 125l. 10s. 4d. ſterling into Poliſh guilders, exchange 265 Poliſh gros per pound Flemiſh, and 34s. 7d. Flemiſh per pound ſterling.

Anſ. 1917 gs. 5 gs. $7\frac{5}{13}$ ps

XI. With SWEDEN.

In Sweden they keep their accounts in copper dollars and orts, or in ſilver dollars, and exchange by the copper dollar.

The par of exchange is one pound ſterling for $34\frac{4}{7}$ copper dollars, and *the courſe of exchange* is from 30 to 50 dollars per pound ſterling.

2 runſticks	make one	ſtiver
8 runſticks		copper marc
3 copper marcs		ſilver marc
4 copper marcs		copper dollar
9 copper marcs		caroline
3 copper dollars		ſilver dollar
3 ſilver dollars		rix-dollar
2 rix-dollars		ducat

EX-

EXAMPLES.

1. In 357l. 8s. 8¼d. ſterling, how many copper dollars, exchange at 49¼ copper dollars per pound ſterling?

£.	c. ds.	£.	s.	d.
As 1	: 49¼	: : 357.	8	8¼
20	4	20		
20	197	7148		
12		12		
240		85784		
4		4		
960		343137		
		197		
		2401959		
		3088233		
		343137		
		96,0)6759798,9(70414		
		672		
		··397		
		384		
		·139		
		96		
		·438		
		384		
		·549		
		8		
		960)4392(4 rs.		
		3840		
		·552		
		960		

17603 2 $4\frac{23}{480}$ Anſ.
c. ds. c. ms. rs.

$\frac{23}{480}$

2. In

2. In 685 ducats, how much ſterling money, exchange at $37\frac{1}{2}$ copper dollars per pound ſterling?

Anſ. 328l. 16s. 0d.

3. Reduce 337l. 5s. 9d. ſterling into rix-dollars, &c., exchange $41\frac{1}{2}$ copper dollars per pound ſterling.

Anſ. 1557r. ds. 3c. ds. 5 rs.

4. In 78 guineas ſterling, how many carolines, &c., exchange $48\frac{1}{2}$ copper dollars per pound ſterling?

Anſ. 1751cs. 5c. ms. $3\frac{1}{2}$rs.

XII. With RUSSIA.

In Ruſſia they keep their accounts in rubles and copecs, and exchange by the ruble.

The par of exchange is 4s. 6d. ſterling for one ruble, and *the courſe of exchange* is from 40 to 60 pence per ruble, or from 48 to 50 ſtivers per ruble by way of Hamburgh and Amſterdam.

4 poluſcas	make one	copec
3 copecs		altin
10 copecs		grievener
25 copecs		polpotin
50 copecs		poltin
100 copecs		ruble

EX-

EXAMPLES.

1. In 68l. 10s. 6d. ſterling, how many rubles, exchange at 4s. 9d. ſterling per ruble?

	s.	d.	rub.	£.	s.	d.
As	4	9	: 1 : :	68	10	6
	12			20		
	57			1370		
				12		
				rs.	cs.	
			57)16446(288		52 $\frac{12}{19}$ Anſ.	
			114			
			·504			
			456			
			·486			
			456			
			·30			
			100			
			57)3000(52 cs.			
			285			
			·150			
			114			
			·36			
			= $\frac{12}{19}$.			
			57			

2. Find how much ſterling is equal to 2581 rubles, 20 copecs, exchange at 4s. 5$\frac{1}{2}$d. ſterling per ruble?

Anſ. 573l. 12s. 0d.

3. In 387l. 8s. 9d. ſterling, how many rubles, &c., exchange at 49 ſtivers per ruble, and 33s. 9$\frac{1}{2}$d. Flemiſh per pound ſterling? Anſ. 1603rbs. 12 $\frac{11}{184}$ cs.

4. In 3210 rubles, 21 copecs, exchange 122 copecs per rix-dollar current, agio 3 per cent., and 34s. 6d. Flemiſh per pound ſterling, how much ſterling money?

Anſ. 617l. 1s. 5$\frac{1}{2}$d.

REMARK.

1ſt. The above are the moſt noted places in Europe which exchange directly with England; exchanges are generally made, with other places, through the medium of ſome one of theſe.

2d. It would occupy too much of this work to ſpecify the different ways that theſe, and other places of conſiderable trade, uſe in keeping their accounts, and making their exchanges one with another.

ARBITRATION of EXCHANGES.

THE courſe of exchange between one kingdom and another, riſes or falls, as the balance of trade happens to vary; and to draw upon or remit to foreign places, in the way that will be moſt profitable, is what is intended to be taught by this rule.

Arbitration is of two kinds, ſingle and compound.

SINGLE ARBITRATION.

In *ſingle arbitration* the courſe of exchange from one o two other places is given, from which is computed the *arbitrated price*, or *par of arbitration* between theſe places.

NOTE.

1ſt. Operations of this kind are performed by the rule of three.

2d. When the *par of arbitration* is found, and *the courſe of exchange* is given, you may eaſily calculate which method of drawing or remitting, will be to the moſt advantage.

OBSERVE.

1ſt. In dealings of this ſort a ſum is allowed the factor for commiſſion, out of the ſum he receives for the draught

draught; and people who trade in this way generally have a perſon engaged for the purpoſe at every place they negotiate with.

2d. When you remit to any place, you really buy the money or bills of that place; and when you draw on any country, you ſell the bills or money of that country.

EXAMPLES.

1. If the exchange between London and Amſterdam be 34s. 6d. per pound ſterling, and the exchange between London and Paris be 2s. $9\frac{1}{2}$d. ſterling per ecu; what is the *par of arbitration* between Amſterdam and Paris?

£.	s.	d.		s.	d.
As 1	: 34	6	: : 2		$9\frac{1}{2}$
20	12		12		
20	414		33		
12			4		
240			134		
4			414		
960			536		
			134		
			536		
			(12)		
		96,0)5547,6(57			
		480			
			s. 4	$9\frac{3}{4}$	$\frac{3}{10}$ Flem. per ecu. Anſ.
		·747			
		672			
		·756			
		4			
		960)3024($\frac{3}{4}$			
		2880			
		·144			
		960	= $\frac{3}{10}$		

2. If

2. If exchange from Paris to London be 32d. ſterling per ecu; and if exchange from Paris to Amſterdam be 54d Flemiſh per ecu; what muſt be the rate of exchange between London and Amſterdam, in order to be on a par with the other two?

Anſ. 33s. 9d. Flem. per pound ſter.

3. If the exchange between Amſterdam and Paris be 56d. per crown, and between Amſterdam and London 35s. 4d. per pound ſterling; required the *arbitrated price* between Paris and London? Anſ. 2s. $7\frac{1}{2}\ \frac{4}{7}$d.

4. If at Amſterdam bills on Paris are at 54 grotes per ecu, and on London at 33s. 9d. Flemiſh per pound ſterling; what is the *par of arbitration* between Paris and London? Anſ. 32d. per ecu.

5. London exchanges on Amſterdam at 34s. 9d. per pound ſterling, and on Liſbon at 5s. $5\frac{1}{2}$d. per milrea; what is the *par of arbitration* between Amſterdam and Liſbon? Anſ. 9s. $5\frac{1}{2}\ \frac{1}{11}$d. per milrea.

6. If the exchange from London to Paris be 32d. ſterling per ecu, and to Amſterdam be 33s. 9d. Flemiſh per pound ſterling; and if, by advice from Holland to France, the courſe of exchange between Paris and Amſterdam is fallen to 4s. 4d. Flemiſh per ecu; what may be gained per cent. by drawing on Paris, and remitting to Amſterdam?

		d.		*cr.*			£.		*crs.*				
As	32	:	1	:	:	100	:	750	due at Paris				
		cr.	*s.*	*d.*		*crs.*		£.	*s.*				
As	1	:	4	4	: :	750	:	162	10	credit at Amſterdam			
	s.	*d.*	£.		£.	*s.*	*d.*	£.	*s.*	*d.*			
As	33	9	: 1	: :	162	10	0	: 96	5	$11\frac{1}{9}$	to be remitted		
								100	0	0			
								£.	3	14	$0\frac{8}{9}$	Anſ.	

7. A merchant at London was ordered to remit 400 crowns to Paris at $32\frac{1}{4}$d. per crown, and to draw upon Amſterdam for the value at 34s. 6d. Flemiſh per pound ſterling; but when the order came to hand, bills on Paris were at $31\frac{1}{4}$d. per crown; what muſt be the rate of

of exchange with Amſterdam to balance this alteration?
Anſ. 33s. $11\frac{1}{4}\ \frac{14}{43}$d.

8. A factor at London is directed to remit to Amſterdam, at 35s. 6d. Flemiſh per pound ſterling; and in order to this to draw on Spain at 36d. per piaſtre. When he received theſe directions, bills for Amſterdam were only at 33s. 9d. Flemiſh. At what rate muſt he draw on Spain that his employer may be no loſer? Anſ. 3s. $1\frac{1}{4}\ \frac{2}{43}$d.

COMPOUND ARBITRATION.

In *compound arbitration* the courſe of exchange between three, four, or more places is given, in order to find how much a remittance, paſſing through them all, will amount to, at the laſt place; or to find the *arbitrated price*, or *par of arbitration*, between the firſt place and the laſt. This may be done by the following,

RULE.

Make two columns of the courſes of exchange, and write the courſe of exchange of one country in the firſt column, and its equal of another country oppoſite to it in the ſecond column, and ſo on till all the courſes are written down; obſerving, that the money of any one country muſt never appear twice in the ſame column, except it is oppoſed to the money of two different countries. Then, divide the product of the quantities in the larger column, by the product of the quantities in the leſſer column, and the quotient will be the arbitrated price of exchange.

NOTE.

1ſt. To ſhorten the operation, terms that happen to be equal or the ſame in both columns may be rejected, and the other terms may be abridged.

2d. When the arbitrated price of exchange is found, the gain or loſs, or the moſt advantageous method of remitting or drawing, may be found by attending to the nature of the queſtion.

3d. When commiſſion is allowed, you muſt obſerve what exchanges it is to be charged upon, and deduct it from each either by the rule of three or the rules of practice.

EX-

EXAMPLES.

1. If London remits 500l. ſterling to Spain, by way of Holland, at 35s. Flemiſh, per pound ſterling; thence to France at 58d. Flemiſh per ecu; thence to Venice, at 100 ecus per 60 ducats; and thence to Spain at 360 marvadies per ducat; how many piaſtres of 272 marvadies each will the 500l. ſterling amount to in Spain?

d.

1l. ſterling = 35 ſhs. or 420 Flem.
58 pence Flemiſh = 1 ecu of France
100 ecus of France = 60 ducats of Venice
1 ducat of Venice = 360 marvadies of Spain
272 marvadies = 1 piaſtre
How many piaſtres = 500l. ſterling

58 + 2 = 29, & 420 + 2 = 210
100 + 100 = 1, & 500 + 100 = 5
272 + 8 = 34, & 360 + 8 = 45
34 + 2 = 17, & 60 + 2 = 30

Abridged.

1 = 210
29 = 1
1 = 30
5
1 = 45
17 = 1
2 = 5

29 | 210
17 | 30
203 | 6300
29 | 45
493 divisor | 315
252
283500
5
ps.
493)1417500(2875 $\frac{215}{493}$ Anſ.
986
4315
3944
3710
3451
2590
2465
125
493

P R O O F.

£. ß. d. Fl. d. Fl. £. ß.
As 1 : 420 : : 500 : 210000.

d. Fl. ecu. ecus. d. Fl.
As 58 : 1 : : 210000 : 3620 $\frac{20}{29}$.

ecus. ds. ecus. ds.
As 100 : 60 : : 3600 $\frac{20}{29}$: 2172 $\frac{12}{29}$.

d. ms. ds. ms.
As 1 : 360 : : 2172 $\frac{12}{29}$: 782068 $\frac{28}{29}$.

ms. ps. ms. ps.
As 272 : 1 : : 782068 $\frac{28}{29}$: 2875 $\frac{215}{493}$.

2. Lon-

2. London has a demand upon Amſterdam of 1000l. Flemiſh; which London orders to be remitted to France at 55d. Flemiſh per ecu; thence to Venice at 60 ducats per 100 crowns; thence to Hamburgh at 8s. 4d. Flemiſh per ducat; thence to Liſbon at 48d. Flemiſh per cruſadoe; and thence home at 5s. 3d. ſterling per milrea; what is the *arbitrated rate of exchange* between Amſterdam and London? Anſ. 34s. $11\frac{1}{11}$d. Flem. per £. ſterling.

3. The exchange between London and Amſterdam is 1 pound ſterling for 11. 18s. Flemiſh; betwixt Amſterdam and Francfort is 72d. Flemiſh for 65 cruitzers; and between Francfort and Paris is 56 cruitzers for 1 ecu; what is the *arbitrated rate of exchange* between London and Paris? Anſ. $7\frac{20}{47}$ ecus per £. ſter.

4. A merchant in London has credit at Venice for 5000 ducats banco, which he orders to be remitted to Cadiz at 326 marvadies per ducat; thence to Liſbon at 634 reas for 270 marvadies; thence to Amſterdam at 48. 4d. Flemiſh for 400 reas; thence to Paris at 4s. 2d. Flemiſh per ecu; and laſtly home at 33d. ſterling per ecu. Required the *arbitrated par of exchange* between London and Venice; and what London will receive after allowing $\frac{1}{4}$ per cent. commiſſion at each place?—Anſ. The arbitrated par of exchange is $65\frac{76453}{112100}$d. per dt. London will receive 1354l. 12s. 10d. nearly.

BILLS of EXCHANGE.

A BILL of exchange is a written order for money to be received in one place or country, for the value paid in another.

RULE.

Date it as a promiſſory note, and put the value in figures, on the ſame line with the date, either on the left-hand or right as is moſt convenient. Then, begin with the time when the bill is to be paid; next, put the

the perſon's name for whoſe uſe it is drawn, adding *or order*, *or bearer*, or any other circumſtance that is agreed upon; after that, mention of whom the value was received, or put the words *value received*, adding *as adviſed*, or *without further advice*, if you think neceſſary. This done, let the drawer ſign his name on the right hand of the bill, and put the name, occupation and place of abode of the perſon who is to be the payer on the left-hand thereof.

NOTE.

1ſt. When both the drawer and payer live in one country, the bill is called *an inland bill of exchange*; but when the drawer lives in one country, and the payer in another, it is called *a foreign bill of exchange*.

2d. A bill of exchange may be made payable to a certain perſon or company, to order, to bearer, at ſight, ſo long after ſight or date, or at a particular time or place.

3d. When a bill is made payable to a particular perſon or company, without either *bearer* or *order* annexed, it cannot be negotiated; when it is made payable to *bearer* it will paſs from one perſon to another without any additional names being written upon it; when it is made payable to *order*, the perſon on whoſe account it is drawn may *indorſe* it (that is write his name on the back of the bill) and ſo deliver it to another, who may pay it again by indorſing it; and ſo it may paſs through any number of hands, each receiver indorſing it before he delivers it to another.

4th. *Advice* is giving a perſon notice, either by the poſt or otherwiſe, that a bill is drawn upon him; and it is neceſſary that this ſhould be done when the words *as adviſed*, or *as per advice*, are inſerted in the bill.

5th. *Days of grace* are certain days allowed after the bill becomes due before payment is demanded, and their

number varies in different countries. In England three days of grace are allowed.

6th. When a bill comes to the place where it is to be paid, it is uſual for the holder to preſent it to the perſon it is drawn upon for *acceptance*. This is done by his writing his name on the bill with the word *accepts* before it, or with the date and the word *accepts* before it, if it be a bill drawn after ſight. If he refuſes to accept it, it muſt be proteſted and returned.

7th. When perſons in partnerſhip draw bills, or when bills are drawn upon any company of tradeſmen, the ſignature or addreſs muſt be made to anſwer the uſual firm of the drawers, or the company drawn upon.

8th. *Value received*, or the thing received, muſt be inſerted in every bill to give it validity in a court of law.

9th. Every inland bill of Exchange, for more than forty ſhillings and under five pounds, muſt be drawn on a three-penny ſtamp; for from five to fifty pounds on a ſix-penny ſtamp; and for more than fifty pounds on a ſhilling ſtamp.

10th. Foreign merchants generally draw upon England in their own coin, and mention the courſe of exchange in the bill; but when England draws upon another country, the courſe of exchange is previouſly ſettled, and need not be mentioned, unleſs the money be Flemiſh, and then the rate muſt be ſpecified, and whether it is banco or currency.

11th. *Uſance* is the cuſtomary time allowed, at particular places, for the payment of a foreign bill, when a particular day is not named in the bill, and is different at different places; and *double uſance* is twice that time.

12th. In drawing foreign bills, it is uſual to draw two or three of the ſame tenor and date, and ſend them by different ſhips, to prevent miſcarriages. Theſe are called *a ſet of exchanges*, and when one of theſe bills is paid the others are of no uſe.

N. B. Bills of exchange, and promiſſory notes, payable on demand, and for leſs than ten pounds, may be drawn on a three-penny ſtamp.

EXAMPLES of Inland BILLS of EXCHANGE.

1. £. 50 0 0 *Denton, 8th Dec.* 1790.

On demand, pay Mr James Wood, fifty pounds, for value received, by

Your humble ſervant,

To Mr John Lee, Grocer, in York. *Edward Hill.*

2. £. 45 10 6 *Denton, 8th Dec.* 1790.

Seven days after ſight, pay Mr George Lane, or bearer, forty-five pounds, ten ſhillings and ſix-pence, for value received of Mr John Weddell, as adviſed by

Your very humble ſervant.

To Mr Edward White, Tea-dealer, in Hull. *William Watſon.*

3. £. 600 0 0 *Denton, 8th Dec.* 1790.

Twenty days after date, pay Mr Joſeph Dixon, or order, ſix hundred pounds, for value received, as per advice from

Your very humble ſervant,

To Mr John Wells, Draper, Cheapſide, London. *George Brown.*

4. £. 3 10 6 *Denton, 8th Dec.* 1790.

Twenty-one days after date, pay Mr John Weddell, of Yarm, or order, three pounds, ten ſhillings and ſix-pence, value received of Mr Richard Wood, and place it to my account, as adviſed by

Joſeph Dixon.

To Mr James Lee, Mercer, in Leeds. } accepts J. L.
Witneſs, Charles Ramſhaw. }

5. £. 90 10 8 *Denton, 8th Dec.* 1790.

Seventeen days after ſight, pay ninety pounds, ten ſhillings and eight pence, to the order of Meſſrs Ruſſell

and Co. for value received of Sir William Forbes, Hunter and Co. by Your humble ſervant,
To Meſſrs Harriſon, Wilſon and Co. Bankers, in London. *James Waldie.*

Dec. 18th, 1790, accepts H. W. and Co.

6. £. 200 0 0 *Denton, 8th, Dec.* 1790.

On the fifteenth day of January next, be pleaſed to pay to Thomas Allgood, Eſq. or order, two hundred pounds, for value received by James Wilſon, Eſq. on account of Walker, ſelf and Co.
To Meſſrs Hattſell and Co. Bankers, in Hull. *James Riland.*

7. Mr John Watſon, grocer, in Darlington, owes Mr James Lane, of London, one hundred pounds; and Mr James Lane would draw on Mr John Watſon for fifty pounds of it, payable to Mr Joſeph Lee, or order, on demand, for value received of himſelf, and give advice of the bill. The form of the bill is demanded?

£. 50 0 0 *London, 8th Dec.* 1790.

On demand, pay Mr Joſeph Lee, or order, fifty pounds, value received of himſelf, and place the ſame to my account, as per advice from,
To Mr John Watſon, Grocer, in Darlington. Your obliged Servant, *James Lane.*

8. John Wales, of Denton, tea-dealer, is one hundred and twenty pounds in debt to Meſſrs Wilſon and Co. for tea; which ſum he remits to them in a bill drawn by Mr John Weddell and Co. on James Watſon, Eſq. London, at forty days after date, and payable to Meſſrs Wilſon and Co. or bearer, without further advice, the value expreſſed as having been received from the ſaid John Wales, of Denton. Required the form of the ſaid bill?

9. Mr George Brown, of Denton, taylor, is indebted to Mr Thomas Wilſon, hoſier, in Stockton, twenty-four pounds; for which ſum Mr Thomas Wilſon draws on him, in favour of Mr Edward Webſter, of Yarm,

or

or order, at ten days ſight, and gives him advice of the ſame. You are deſired to draw out a form for the above bill?

10. Mr John Wood, of Denton, would remit to Mr Robert Raine, of London, one hundred and ten pounds; and for this purpoſe applies to Mr James Wilſon, of Darlington, who has a correſpondent in London, who owes him money. Mr John Wood pays Mr James Wilſon this one hundred and ten pounds, and Mr James Wilſon gives him a draught for it, at 7 days ſight, on his correſpondent in London, whoſe name is Mr William Long, and this draught Mr John Wood remits inſtead of caſh to Mr Robert Raine, and gives Mr William Long advice of the bill. The form of the above bill is demanded?

EXAMPLES of Foreign BILLS of EXCHANGE.

1. *Denton, 8th Dec.* 1790.

For 1000 milreas, at double uſance.

At double uſance, pay this my ſole bill of exchange, to Mr John Wilſon, or order, the ſum of one thouſand milreas, value received of John Webb, Eſq., and place it to my account, as adviſed by

Your humble ſervant,

To Mr John Webſter, Merchant, in Liſbon. } Accepts J. W. *John Walſh.*

2. *Liſbon, 8th Dec.* 1790. For 250l. ſterling.

At uſance, pay this my only bill of exchange, to Mr John Weddell, or order, two hundred and fifty pounds ſterling, the value ſhipped here for your uſe in the Emma, of Newcaſtle, and conſigned, as per advice, from - Your very humble ſervant,

To Mr Edward Willis, Merchant, in London. *George Han.*

3. *Denton, 8th Dec.* 1790.

For £. 300 ſterling, at 33s. 9d. Flemiſh.

At double uſance, pay this my only bill of exchange, to Mr John Ward, or order, three hundred pounds ſterling, at thirty-three ſhillings and nine-pence Flemiſh per pound ſterling, the value received of Mr William Rutter, and place it to account, as adviſed by

To Mr John Wallis, Merchant, at Antwerp. Your humble ſervant, *Robert Dent.*

4. *Paris, 8th Dec.* 1790.

For 400 crowns, at 33½d. at uſance.

At uſance, pay this my firſt of exchange, to Mr John Wood, or order, four hundred crowns, at thirty-three pence half-penny per crown, value received of Mr John Peacock, and place it to my account, as per advice from *Hugh Peham.*

To Mr John Webb, Merchant, in Hull.

Paris, 8th Dec. 1790.

For 400 crowns, at 33½d. at uſance.

At uſance, pay this my ſecond of exchange (my firſt not paid) to Mr John Wood, or order, four hundred crowns, at thirty-three pence half-penny per crown, value received of Mr John Peacock, and place it to my account, as per advice from *Hugh Peham.*

To Mr John Webb, Merchant, in Hull.

5. Mr John Willett, of Paris, draws on Meſſrs Hoare and Co. Bankers, in London, for the value of 370 crowns at 34¼d. double uſance, payable to Joſeph Rider Eſq. or order, as per advice, the value being received of Mr Edward Roſs. You are deſired to draw out the forms of firſt and ſecond bill for this purpoſe.

Paris, 8th Dec. 1790.

For 370 crowns, at 34¼d. double uſance.

At double uſance, pay this my firſt of exchange to Joſeph Rider, Eſq. or order, three hundred and ſeventy crowns, at thirty-four pence farthing per crown, the value being received of Mr Edward Roſs, and place the ſame to my account, as adviſed by *John Willett.*

To Meſſrs Hoare and Co. Bankers, in London.

Paris,

Paris, 8*th Dec.* 1790.

For 370 crowns, at 34¼d. double uſance.

At double uſance, pay this my ſecond of exchange (my firſt not paid) to Joſeph Rider, Eſq. or order, three hundred and ſeventy crowns, at thirty-four pence farthing per crown, the value being received of Mr Edward Roſs, and place the ſame to my account, as adviſed by *John Willett.*

To Meſſrs Hoare and Co.
Bankers, in London.

6. Mr Jaſper Gibſon, of London, would draw on Mr Jacob Hill, of Rotterdam, in favour of Henry Wilſon, Eſq. or order, at twenty days after ſight, for 575 £. ſterling, exchange at 33s. 9½d. Flemiſh per £. ſterling, for value received of ditto Wilſon, without further advice. The form of two bills, ſuitable to theſe circumſtances, are demanded?

7. Meſſrs Harley and Wells, of London, would draw on Meſſrs Ray and Wright, of Oporto, for 175.387 reas, in favour of Mr John Long, or order, at uſance, for value received of them in goods, and have the ſame placed to account, as per advice. You are deſired to draw out two bills ſuitable for the purpoſe.

REMARK.

Uſance between England and France is 30 days after date; between England and Hamburgh, Amſterdam, Rotterdam, Flanders, &c. is one calendar month after date; between England and Spain or Portugal is two calendar months after date; and between England and Genoa, Leghorn, Milan, Venice or Rome is three calendar months after date.

VULGAR FRACTIONS.

A *Vulgar Fraction* is an expreſſion of a part or parts of ſome quantity, by two numbers, one above the other, with a line between them. The

The upper number is called the *numerator*, and the lower number the *denominator*.

The denominator ſhews into how many parts the integer is divided; and *the numerator* ſhews how many of thoſe parts the fraction conſiſts of.

A ſimple or ſingle fraction is a ſingle expreſſion for any number of parts of the integer; as, $\frac{1}{6}$, $\frac{8}{9}$, $\frac{9}{5}$.

A compound fraction is the fraction of a fraction or fractions, and is known by the word of; as, $\frac{1}{4}$ of $\frac{5}{6}$, $\frac{1}{8}$ of $\frac{9}{10}$ of $\frac{11}{12}$ of $\frac{12}{13}$.

A proper fraction is when the numerator is leſs then the denominator; as, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{5}$, $\frac{7}{12}$.

An improper fraction is when the numerator is greater than the denominator; as, $\frac{9}{4}$, $\frac{8}{7}$, $\frac{24}{10}$.

A mixed number is compoſed of a whole number and a fraction joined together; as $4\frac{5}{8}$, $6\frac{1}{2}$, $8\frac{3}{11}$.

A complex fraction has a mixed number for its numerator, for its denominator, or for both; as

$\frac{2\frac{1}{3}}{7}$ $\frac{4}{9\frac{1}{2}}$ $\frac{2\frac{1}{5}}{9\frac{3}{5}}$.

NOTE.

1ſt. A whole number or integer may be turned into a fraction by making one its denominator; as, $\frac{8}{1}$, $\frac{9}{1}$, $\frac{13}{1}=8$, 9, and 13.

2d. A proper fraction is always leſs than unity or one, and an improper fraction is always greater than unity or one.

REDUCTION of VULGAR FRACTIONS.

REDUCTION of vulgar fractions is the bringing them out of one form into another, without altering their values.

CASE I.

To reduce a vulgar fraction to its loweſt terms.

RULE

RULE.

Divide the greater term by the leſs, and this diviſor by the remainder, and ſo on, always dividing the laſt diviſor by the laſt remainder, till nothing remains. Then, divide both the terms of the fraction by the laſt diviſor, (called the *common meaſure*) and the quotients will be the fraction required.

NOTE.

1ſt. A vulgar fraction may be reduced to its loweſt terms by dividing each of its terms by any number that will divide them without a remainder, and then theſe quotients again by another number in the ſame manner, and ſo on till no number greater than one will divide them; then, the laſt quotients will be the loweſt terms of the fraction

2d. When a cipher or ciphers happen to be on the right hand of both terms, cut off an equal number in each of them, and abbreviate the remaining figures as above.

EXAMPLES.

1. Reduce $\frac{176}{484}$ to its loweſt terms

176)484(2
352
132)176(1
132
Common meaſure . 44)132(3
132
...

$\frac{176}{484} \div 44 = \frac{4}{11}$ Anſ.

2. Abbreviate $\frac{102}{170}$ as much as poſſible. Anſ. $\frac{3}{5}$.
3. Reduce $\frac{672}{768}$ to its loweſt terms. Anſ. $\frac{7}{8}$.
4. Reduce $\frac{96}{144}$ to its loweſt terms. Anſ. $\frac{2}{3}$ or 3.
5. Abbreviate $\frac{550}{700}$ as much as poſſible. Anſ. $\frac{11}{14}$.

6. Re-

6. Reduce $\frac{275}{490}$, $\frac{1134}{1512}$ and $\frac{3872}{4901}$ to their leaſt terms.
Anſ. $\frac{55}{98}$, $\frac{28}{140}$ and $\frac{484}{621}$.
7. What is the loweſt terms of $\frac{2381}{273}$? Anſ. $\frac{349}{39}$.
8. Find the loweſt terms of $\frac{521000}{771800}$. Anſ. $\frac{2605}{3859}$.

C A S E II.

To reduce an improper fraction to a mixed number, or to an integer.

R U L E.

Divide the numerator by the denominator, and the quotient will be an integer; and if there is a remainder, make it a numerator to the given denominator: then, reduce the fraction to its loweſt terms, and annex it to the integer.

E X A M P L E S.

1. Reduce $\frac{124}{13}$ to a mixed number.

13(124(9
117

7

13

Anſ. $9\frac{7}{13}$.

2. Reduce $\frac{106}{7}$ to a mixed number. Anſ. $15\frac{1}{7}$.
3. Reduce $\frac{161}{20}$ to a whole or mixed number.
Anſ. $8\frac{7}{20}$.
4. Reduce $\frac{888}{24}$ to a whole or mixed number.
Anſ. $24\frac{1}{2}$.
5. Reduce $\frac{168}{8}$ to a whole or mixed number. Anſ. 21.
6. Reduce $\frac{3843}{21}$ to a whole or mixed number. Anſ. 183.
7. Reduce $\frac{52110}{211}$ to a whole or mixed number.
Anſ. $247\frac{93}{211}$.

C A S E III.

To reduce a mixed number to an improper ſingle fraction.

RULE.

R U L E.

Multiply the integer by the denominator of the given fraction, and to the product add the numerator; then the sum written above the denominator will form the fraction required.

E X A M P L E S.

1. Reduce $12\frac{7}{9}$ to an improper fraction.

$$12\frac{7}{9}$$
$$9$$
$$115$$
$$9 \text{ Anſ.}$$

2. Let $18\frac{3}{4}$ be reduced to an improper ſingle fraction. Anſ. $\frac{75}{4}$.

3. Reduce $31\frac{9}{17}$ to an improper fraction.—Anſ. $\frac{536}{17}$.

4. Reduce $93\frac{64}{83}$ to an improper ſingle fraction. Anſ. $\frac{7783}{83}$.

5. Reduce $514\frac{1}{18}$ to an improper fraction. Anſ. $\frac{9253}{18}$.

6. Reduce $175\frac{78}{97}$ to an improper fraction. Anſ. $\frac{17053}{97}$.

C A S E IV.

To reduce a compound fraction to a ſingle one.

R U L E.

Multiply all the numerators together for a new numerator, and all the denominators together for a new denomator: then, reduce the new fraction to its loweſt terms for the anſwer.

NOTE.

N O T E.

If a part of the compound fraction be a whole or mixed number, it must be reduced to an improper fraction by the last case.

E X A M P L E S.

1. Reduce $\frac{2}{3}$ of $\frac{4}{5}$ of $\frac{5}{7}$ of $\frac{8}{9}$ to a single fraction.

$$2 \times 4 \times 5 \times 8 = 320 \text{ new num.} = \frac{160}{567} \text{ Anf.}$$
$$3 \times 5 \times 7 \times 9 = 1134 \text{ new den.}$$

2. Reduce $\frac{2}{3}$ of $\frac{3}{7}$ of $\frac{5}{8}$ to a single fraction. Anf. $\frac{5}{28}$.
3. Reduce $\frac{2}{7}$ of $\frac{5}{8}$ of $\frac{9}{10}$ of 6 to a single fraction. Anf. $\frac{27}{8}$.
4. Reduce $\frac{1}{8}$ of $3\frac{1}{2}$ of $\frac{1}{9}$ of $7\frac{1}{4}$ of $\frac{6}{9}$ to a single fraction. Anf. $\frac{203}{864}$.
5. Reduce $\frac{1}{2}$ of $\frac{1}{8}$ of $7\frac{1}{4}$ to a simple fraction. Anf. $\frac{87}{64} = 1\frac{23}{64}$.
6. What is $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{4}{5}$ of $\frac{7}{8}$ of 11? Anf $\frac{77}{30} = 2\frac{17}{30}$.
7. Reduce $\frac{1}{8}$ of $\frac{1}{12}$ of $13\frac{1}{2}$ to a simple fraction. Anf. $\frac{99}{864} = 1\frac{135}{64}$.
8. Let $\frac{5}{9}$ of 4 of $\frac{8}{12}$ of $6\frac{1}{4}$ be reduced to a simple fraction. Anf. $9\frac{7}{27}$.

C A S E V.

To reduce fractions of different denominators to a common denominator.

R U L E.

Multiply each numerator into all the denominators but its own for new numerators, and all the denominators together for a new denominator: then, write the new denominator under each of the new numerators.

N O T E.

In reducing the new fractions to their lowest terms, the numerators and common denominator must all be divided by one common measure.

EX-

EXAMPLES.

1. Reduce $\frac{1}{3}$, $\frac{4}{7}$ and $\frac{8}{9}$ to a common denominator.

$3\times7\times9=189$
$4\times5\times9=180$
$8\times5\times7=280$
$5\times7\times9=315$ Anſ. $\frac{189}{315}$, $\frac{180}{315}$ and $\frac{280}{315}$.

2. Reduce $\frac{1}{4}$, $\frac{2}{7}$ and $\frac{3}{8}$ to a common denominator.
Anſ. $\frac{56}{224}$, $\frac{64}{224}$ and $\frac{84}{224}$.

3. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$ to a common denominator. Anſ. $\frac{360}{720}$, $\frac{240}{720}$, $\frac{180}{720}$, $\frac{144}{720}$ and $\frac{120}{720}$.

4. Reduce $\frac{1}{3}$, $\frac{3}{4}$ of $\frac{4}{5}$, $5\frac{1}{2}$ and $\frac{2}{10}$ to a common denominator. Anſ. $\frac{10}{30}$, $\frac{18}{30}$, $\frac{165}{30}$ and $\frac{6}{30}$.

5. Reduce $\frac{1}{9}$ of 5 and $\frac{2}{7}$ of $\frac{1}{3}$ to the ſame denominator. Anſ. $\frac{35}{63}$ and $\frac{6}{63}$.

6. Reduce $\frac{5}{10}$, $2\frac{3}{4}$ and 4 to a common denominator.
Anſ. $\frac{25}{30}$, $\frac{73}{30}$ and $\frac{100}{30}$.

CASE VI.

To reduce a whole number to a fraction having a given denominator.

RULE.

Multiply the whole number by the given denominator, and under this product write the ſame denominator.

EXAMPLES.

1. Let 21 be reduced to a fraction, and the denominator be 12.
Anſ. $21\times12=\frac{252}{12}$.

2. Reduce 6 to a fraction whoſe denominator ſhall be 8. Anſ. $\frac{48}{8}$.

3. Reduce 11 to a fraction whoſe denominator ſhall be 13. Anſ. $\frac{143}{13}$.

4. Reduce 18 to a fraction whoſe denominator ſhall be 25. Anſ. $\frac{450}{25}$.

CASE VII.

To reduce fractions of one denomination to equivalent fractions of another *greater* denomination.

RULE.

Compare the given fraction with every term between the denomination given and required, placing the word *of* between every term: then, reduce the compound fraction to a single one for the answer.

EXAMPLES.

1. Reduce $\frac{1}{3}$ of a penny to the fraction of a pound.
Anſ. $\frac{1}{3}$ of $\frac{1}{12}$ of $\frac{1}{20} = \frac{1}{720}$

2. Reduce $\frac{1}{6}$ of a farthing to the fraction of a guinea.
Anſ. $\frac{1}{8064}$.

3. Reduce $\frac{9}{10}$ of a penny to the fraction of a moidore.
Anſ. $\frac{1}{4320}$.

4. Reduce $\frac{8}{11}$d. to the fraction of a mark.
Anſ. $\frac{1}{2250}$.

5. Reduce $\frac{5}{7}$ of an ounce to the fraction of a lb. troy.
Anſ. $\frac{5}{84}$.

6. Reduce $\frac{27}{28}$ of a dram to the fraction of a cwt.
Anſ. $\frac{27}{7168}$.

7. Reduce $\frac{7}{9}$ of a nail to the fraction of an ell Engliſh.
Anſ. $\frac{7}{180}$.

8. Reduce $\frac{15}{17}$ of a pint to the fraction of a hhd. of wine.
Anſ. $\frac{5}{4320}$.

9. Reduce $\frac{1}{5}$ of a peck to the fraction of a coal chaldron.
Anſ. $\frac{1}{720}$.

10. Reduce $\frac{1}{4}$ of a minute to the fraction of a day.
Anſ. $\frac{1}{5760}$.

CASE VIII.

To reduce fractions of one denomination to equivalent fractions of another *leſs* denomination.

RULE.

R U L E.

Multiply the given numerator into all the denominations between it and the denomination fought for a new numerator: under this write the given denominator, and reduce the fraction to its loweſt terms for the anſwer.

E X A M P L E S.

1. Reduce $\frac{3}{240}$ of a pound to the fraction of a ſhilling.
Anſ. $3\times 20=\frac{60}{240}=\frac{1}{4}$.

2. Reduce $\frac{1}{960}$ of a pound to the fraction of a penny.
Anſ. $\frac{1}{4}$.

3. Reduce $\frac{1}{1440}$ of a pound to the fraction of a farthing.
Anſ. $\frac{1}{4}$.

4. Reduce $\frac{1}{1728}$ of a moidore to the fraction of a farthing.
Anſ. $\frac{1}{4}$.

5. Reduce $\frac{6}{784}$ of a cwt. to the fraction of lb.
Anſ. $\frac{6}{7}$.

6. Reduce $\frac{1}{320}$ of a lb. to the fraction of a dwt.
Anſ. $\frac{1}{4}$.

7. Reduce $\frac{1}{648}$ of a chaldron of coals to the fraction of bl.
Anſ. $\frac{1}{72}$.

8. Reduce $\frac{1}{210}$ of a week to the fraction of an hour.
Anſ. $\frac{4}{5}$.

C A S E IX.

To reduce fractions of one denomination to equivalent fractions of another denomination, when a number of the leſs is not exactly contained in the greater.

R U L E.

Compare the given fraction with another fraction ſome of whoſe denominations are contained in the fraction fought: then, proceed by caſe 7th or caſe 8th as the queſtion may require.

EXAMPLES.

1. Reduce $\frac{4}{9}$ of a £. to the fraction of a moidore.
Anſ. $\frac{4}{9}$ of $\frac{20}{1}=\frac{80}{9}$ of a ſ.; and $\frac{80}{9}\times\frac{1}{27}=\frac{80}{243}$

2. Reduce $\frac{4}{14}$ of a guinea to the fraction of a £.
Anſ. $\frac{3}{10}$.

3. Reduce $\frac{3}{5}$ of a crown to the fraction of mark.
Anſ. $\frac{1}{1}$.

4. Reduce $\frac{2}{7}$ of a ſhilling to the fraction of half a crown.
Anſ. $\frac{18}{25}$.

5. Reduce $\frac{8}{10}$ of an ell Engliſh to the fraction of a yard.
Anſ. $\frac{10}{19}$.

6. Reduce $\frac{1}{21}$ of a hhd. to the fraction of an anker.
Anſ. $\frac{6}{10}$.

7. Reduce $\frac{5}{7}$ of a puncheon to the fraction of a hhd.
Anſ. $\frac{20}{21}$.

8. Reduce $\frac{4}{5}$ of a quarter to the fraction of a chaldron.
Anſ. $\frac{8}{41}$.

CASE X.

To reduce fractions to their proper quantities.

RULE.

Multiply the numerator by the parts in the next inferior denomination, and divide the product by the denominator. Treat the remainder (if any) in the ſame manner; and thus proceed, if neceſſary, till you come to the loweſt denomination in the given integer. Then, the quotients placed after one another, in their order, will be the anſwer.

EX.

EXAMPLES.

1. Reduce $\frac{5}{9}$ of a £. ſterling to its proper quantity.

5
20
—— s. d.
9)100(11 $1\frac{8}{9}$ $\frac{1}{3}$ Anſ
9
—
10
9
—
1
12
—
9)12(1d.
9
—
3
4
—
9)12($\frac{4}{9}$
9
—
3
—— = $\frac{1}{3}$
9

2. What is the value of $\frac{1}{8}$ of a £. ſterling?
Anſ. 7s. 6d.

3. Find the value of $\frac{2}{3}$ of $\frac{3}{5}$ of $\frac{5}{10}$ of a guinea?
Anſ. 3s. 6d.

4. Reduce $\frac{8}{15}$ of 2s. $5\frac{1}{2}$d. to its proper quantity.
Anſ. 1s. $3\frac{1}{2}$ $\frac{14}{15}$d.

5. Required the value of $\frac{1}{2}$ of $\frac{1}{8}$ of $\frac{1}{9}$ of a moidore?
Anſ. $2\frac{1}{4}$d.

6. What is the value of $\frac{1}{3}$ of a lb. troy?
Anſ. 7 ozs. 4 dwts.

7. Reduce $\frac{5}{11}$ of 3 lbs. avoirdupoiſe to its proper quantity. Anſ. 1 lb. 5 ozs. 13 $\frac{1}{11}$ dms.

8. Required the value of $\frac{7}{12}$ of $\frac{1}{8}$ of a ton?
Anſ. 4 cwts. 1 qr. 14 lbs.

9. What is the value of $\frac{1}{4}$ of a ton of wine?
Anſ. 2 hhds. 31 gs. 2 qts.

10. Find the value of $\frac{2}{11}$ of a hhd. of ale.
Anſ. 6 gs. $3\frac{3}{11}$ pts.

11. What is the proper quantity of $\frac{2}{3}\frac{2}{3}\frac{7}{4}$ of an acre?
Anſ. 2 rs. $14\frac{7}{12}$ ps.

12. Reduce $\frac{2}{3}$ of $\frac{1}{8}$ of an ell Engliſh to its proper quantity. Anſ. 1 qr. 1 n.

13. Find the value of $\frac{1}{9}$ of a quarter of corn.
Anſ. 4 bls. 1 pk. 1 gn. $2\frac{2}{9}$ qts.

14. I demand the value of $\frac{1}{7}$ of $\frac{1}{9}$ of a week?
Anſ. 2 ds. 8 hs.

15. What is the value of $\frac{1}{7}$ of a month?
Anſ. 2 ws. 6 ds.

CASE XI.

To reduce money, weights or meaſures to fractions.

RULE.

Bring the given denomination into the loweſt name mentioned for a numerator, and the ſpecified integer into the ſame name for a denominator. Then, reduce the fraction to its loweſt terms for the anſwer.

EXAMPLES.

1. Reduce 3s. $9\frac{1}{2}$d. to the fraction of a pound.

s. d.	£.
3 $9\frac{1}{2}$	1
12	20
45	20
4	12
182 num.	240
	4
	960 den.

Anſ. $\frac{182}{960} = \frac{91}{480}$.

2. Re-

2. Reduce $8\frac{3}{4}$d. to the fraction of a ſhilling.
Anſ. $\frac{35}{240}$.

3. Reduce 8s. 2d. to the fraction of a guinea.
Anſ. $\frac{7}{126}$.

4. What part of 5l. 9s. 0d. is 4l. 13s. $5\frac{1}{7}$d. Anſ. $\frac{6}{7}$.

5. Reduce 4 ozs. 11 dwts. 17 gs. to the fraction of a pound troy. Anſ. $\frac{2201}{5760}$.

6. What fraction of a ſtone is $8\frac{1}{2}$ lbs.? Anſ. $\frac{17}{224}$.

7. Reduce 17 lbs. 10 ozs. 11 drms. to the fraction of a cwt. Anſ. $\frac{45233}{180672}$.

8. Reduce 2 ft. 8 ins. 7 lb. c. $\frac{3}{10}$ to the fraction of a yard. Anſ. $\frac{9}{10}$.

9. Reduce 3 qrs. $\frac{1}{8}$ to the fraction of an ell Engliſh.
Anſ. $\frac{5}{8}$.

10. A perſon bought 2 rs. 11 ps. of land; what part of an acre is that? Anſ. $\frac{91}{160}$.

11. Reduce 2 hhds. 45 gs. of wine to the fraction of a ton. Anſ. $\frac{109}{252}$.

12. Reduce $13\frac{1}{2}$ bls. of coals to the fraction of a chaldron. Anſ. $\frac{3}{8}$.

13. What fraction of a month is 1 wk. 3 ds. 12 hs.?
Anſ. $\frac{3}{8}$.

ADDITION of VULGAR FRACTIONS.

R U L E.

Reduce compound fractions to ſingle ones, mixed numbers to improper fractions, and fractions of different denominations to the ſame denomination. Then, reduce them to a common denominator, add all the new numerators together, and under their ſum write the common denominator. Bring this laſt fraction to its loweſt terms, to a mixed number, or to its proper quantity for the anſwer.

NOTE.

NOTE.

1st. In adding mixed numbers, it will shorten the operation if you only reduce the fractional parts to a common denominator, and add the integers separately.

2d. When the fractions are of several denominations, it will frequently be found the easiest method to reduce them to their proper quantities, and then add them as in Addition of compound quantities.

EXAMPLES.

1. Add $\frac{7}{10}$, $\frac{11}{12}$ and $\frac{4}{9}$ together.

7×12×9= 756	756
11×10×9= 990	990
4×10×12= 480	480
10×12×9=1080	
	2226
	$=2\frac{111}{180}$. Anf.
	1080

2. Required the sum of $\frac{3}{7}$, $4\frac{1}{2}$ and $\frac{6}{9}$?—Anf. $5\frac{101}{126}$.
3. Add together $\frac{1}{8}$ of $\frac{9}{10}$ and $\frac{1}{4}$ of $\frac{7}{8}$. Anf. $\frac{149}{160}$.
4. Add $\frac{2}{3}$, $\frac{1}{7}$, $\frac{1}{4}$ and $\frac{2}{5}$ of $\frac{1}{6}$ into one sum. Anf. $1\frac{41}{420}$.
5. What is the sum of $\frac{1}{7}$, $\frac{4}{5}$ of $\frac{1}{3}$ and $9\frac{1}{10}$?
Anf. $10\frac{1}{60}$.
6. Add $7\frac{2}{3}$, $9\frac{4}{7}$ and $6\frac{1}{10}$ together. Anf. $24\frac{1}{60}$.
7. Add $\frac{1}{8}$ of a pound and $\frac{7}{8}$ of a shilling together.
Anf. 13s. $4\frac{1}{2}$d.
8. What is the sum of $\frac{11}{7}$l. $\frac{3}{9}$s. and $\frac{5}{12}$d.?
Anf. 3s. $1\frac{1}{4}\frac{10}{21}$d.
9. Required the sum of $\frac{1}{4}$ of a guinea, and $\frac{1}{8}$ of a pound? Anf. $1\frac{31}{40}$l. or 1l. 1s. 6d.
10. Add $\frac{1}{2}$ of a lb. troy to $\frac{7}{12}$ of an ounce.
Anf. 6 ozs. 11 dts. 16 grs.
11. Add $\frac{1}{8}$ cwt., $\frac{7}{10}$ qr. and $\frac{1}{20}$ of $\frac{3}{4}$ lb. together.
Anf. 2 qrs. 5 lbs. $15\frac{1}{5}$ ozs.
12. Find the sum of $\frac{7}{8}$ mile, $\frac{3}{4}$ yd. and $\frac{2}{3}$ foot.
Anf. 7 fgs. 2 ft. $7\frac{4}{3}$ ins.
13. Add $\frac{4}{9}$ of a chaldron to $\frac{7}{8}$ of a bl.
Anf. 16 bls. $3\frac{1}{2}$ pks.

14. Re-

14. Required the sum of $\frac{4}{5}$ of $\frac{7}{8}$ of a yard and $\frac{5}{9}$ of 3 qrs. 3 ns.? Anf. $3\frac{13}{80}$ qrs.

15. Add $\frac{5}{6}$ of a barrel of beer, $\frac{2}{7}$ of a gallon and $\frac{1}{8}$ of a pint together. Anf. 26 gs. $\frac{1}{8}$ p.

16. Add $\frac{1}{3}$ of a wk., $\frac{1}{4}$ of a day and $\frac{1}{2}$ of an hour together. Anf. 2 da. $14\frac{1}{2}$ hs.

SUBTRACTION of VULGAR FRACTIONS.

RULE.

The fractions being prepared as directed in addition; the difference of the new numerators written above the common denominator will give the difference of the fractions required.

NOTE.

It will often be very convenient to reduce fractions of different denominations to their proper quantities before fubtraction is made.

EXAMPLES.

1. What is the difference between $\frac{11}{16}$ and $\frac{7}{13}$?

$11\times13=143$ n. n. — 143

$7\times16=112$ n. n. — 112

$16\times13=208$ c. d. — 31 Anſ.

208

2. What is the difference between $\frac{1}{7}$ and $\frac{4}{30}$? Anf. $\frac{5}{210}$.

3. From $\frac{97}{100}$ take $\frac{1}{4}$. Anf. $\frac{73}{100}$.

4. From 12 fubtract $\frac{5}{6}$ of $\frac{7}{8}$ of $\frac{3}{4}$. Anf. $11\frac{29}{64}$.

5. What is the difference between $5\frac{3}{8}$ and $\frac{2}{7}$ of $4\frac{1}{6}$? Anf. $4\frac{31}{168}$.

6. From $96\frac{1}{3}$ take $14\frac{3}{7}$. Anf. $81\frac{19}{21}$.

7. What

7. What is the difference of $\frac{8}{10}$ £. and $\frac{1}{4}$ of $\frac{3}{4}$ £.?
Anf. 15s. $1\frac{5}{7}$d.

8. Required the difference between $\frac{7}{8}$ £. and $\frac{1}{7}$ guinea?
Anf. 10s. 6d.

9. From $\frac{2}{7}$ of $5\frac{1}{8}$ £. take $\frac{1}{5}$ of a ſhilling.
Anf. 1l. 8s. $11\frac{1}{35}$d.

10. From $\frac{1}{5}$ of an oz. take $\frac{7}{8}$ of a dwt.
Anf. 11 dwts. 3 grs.

11. From $\frac{3}{4}$ of a yard take $\frac{1}{8}$ of an inch.
Anf. 2 ft. $2\frac{1}{8}$ ins.

12. From 7 weeks take $9\frac{7}{10}$ days.
Anf. 5 ws. 4 ds. 7 hs. 12 ms.

13. From $\frac{1}{2}$ of a hhd. of beer take $3\frac{4}{5}$ of a gn.
Anf. 23 gns. $0\frac{4}{5}$ q.

MULTIPLICATION of VULGAR FRACTIONS.

RULE.

Let the fractions be prepared as before. Then, multiply all the numerators for a new numerator; and all the denominators for a new denominator. Reduce this laſt fraction as before directed for the anſwer.

EXAMPLES.

1. Multiply $\frac{6}{11}$ by $\frac{7}{12}$.

$$6 \times 7 = 42 = \frac{7}{22} \text{ Anf.}$$
$$11 \times 12 = 132$$

2. Required the product of $\frac{2}{3}$, $\frac{3}{7}$ and $\frac{9}{10}$? Anf. $\frac{27}{115}$.
3. What is the product of $\frac{5}{6}$ and $\frac{2}{3}$ of $\frac{6}{7}$? Anf. $\frac{10}{21}$.
4. Multiply $4\frac{1}{2}$, $\frac{3}{4}$ of $\frac{1}{7}$ and $18\frac{4}{5}$ continually together.
Anf. $9\frac{9}{140}$.
5. I demand the product of $3\frac{2}{7}$ and $4\frac{14}{11}$? Anf. $14\frac{124}{311}$.
6. Find the product of $\frac{7}{8}$ of $4\frac{1}{2}$ and $8\frac{1}{6}$. Anf. $30\frac{139}{144}$.
7. Multiply $\frac{3}{8}$ of a pound by $\frac{4}{7}$ of a ſhilling.
Anf. $2\frac{1}{2}\frac{2}{5}$d.

8. Re-

8. Required the product of $\frac{1}{9}$ of 3$\frac{1}{2}$l. and $\frac{1}{7}$ of a guinea? Anſ. 1s. 2d.

9. Multiply $\frac{1}{3}$ of a ton and $\frac{6}{8}$ of a cwt. together. Anſ. 3 cwts.

10. Find the product of $\frac{1}{7}$ of a yard and $\frac{1}{4}$ of an ell Engliſh. Anſ. 1$\frac{2}{14}$u.

11. Required the product of 4ft. 10ins. by $\frac{1}{3}$ of $\frac{5}{7}$ of a yard? Anſ. 8$\frac{3}{7}$ ins.

12. Multiply $\frac{1}{7}$ of a week by $\frac{1}{9}$ of 4 days. Anſ. 1d. 8hs.

DIVISION of VULGAR FRACTIONS.

R U L E.

Having prepared the fractions properly, multiply the numerator of the dividend by the denominator of the diviſor for a new numerator; and the other two fractions for a new denominator. Or, invert the diviſor, and proceed as in Multiplication.

E X A M P L E S.

1. Divide 9$\frac{1}{6}$ by $\frac{2}{3}$ of 7.

$9\frac{1}{6} = \frac{55}{6}$ $\quad 55 \times 2 = \frac{110}{42} = 2\frac{26}{42}$ Anſ.

$\frac{1}{2}$ of $7 = \frac{7}{2}$ $\quad 6 \times 7 = 42$

2. Divide $\frac{2}{11}$ by $\frac{3}{7}$ of $\frac{7}{8}$. Anſ. $\frac{24}{77}$.

3. Divide 7$\frac{1}{3}$ by 9$\frac{5}{9}$. Anſ. $\frac{33}{43}$.

4. What is the quotient of 3$\frac{5}{9}$ by 2$\frac{1}{2}$? Anſ. 1$\frac{19}{45}$.

5. What is the quotient of 4$\frac{5}{9}$ by $\frac{5}{9}$ of 4? Anſ. 2$\frac{1}{10}$.

6. Divide $\frac{3}{7}$ of $\frac{8}{9}$ of 4 by $\frac{1}{7}$ of $\frac{3}{10}$ of $\frac{1}{3}$ of 8. Anſ. 15$\frac{56}{63}$.

7. Divide $\frac{1}{7}$ of 3l. by $\frac{6}{8}$ of 15s. Anſ. 1s. 0$\frac{4}{5}$ $\frac{1}{5}$d.

8. What is the quotient of 2 ft. 5 ins. by 10 ins. Anſ. 2$\frac{9}{10}$ ft.

9. Divide $\frac{7}{8}$ of 9 feet by $\frac{1}{3}$ of 2 ft. 9 ins. Anſ. 5$\frac{34}{88}$ ft.

10. What is the quotient of $\frac{4}{10}$ of 41gs. by 3$\frac{7}{8}$ qts.? Anſ. 4gs. 1$\frac{13}{31}$ pt.

The

The RULE of THREE in VULGAR FRACTIONS.

RULE.

State the queſtions as in whole numbers, having firſt prepared the fractions as they may require. Then, multiply the denominator of the firſt term into the numerators of the ſecond and third terms for a new numerator, and the numerator of the firſt term into the denominators of the ſecond and third terms for a new denominator. Let this new fraction be reduced to its proper quantity for the anſwer.

EXAMPLES.

1. If $19\frac{1}{4}$ buſhels of oats be worth 1l. 18s. 6d.; what are $61\frac{3}{4}$ buſhels of the ſame worth?

$$\begin{array}{lll} \text{£. s. d.} & & \\ 19\frac{1}{4}=\frac{77}{4} \quad 1\ 18\ 6=\frac{77}{40} & 61\frac{3}{4}=\frac{247}{4} & \\ \text{bls.} \quad \text{£.} \quad \text{bls.} & & \\ \text{As } \frac{77}{4} : \frac{77}{40} :: \frac{247}{4} & & \\ 4\times77\times247=\frac{76076}{12320}=\text{6l. 3s. 6d. Anſ.} & & \\ 77\times40\times\ 4=12320 & & \end{array}$$

2. If 1 ell Flemiſh coſt $3\frac{1}{8}$s.; what are $4\frac{1}{2}$ yards worth? Anſ. 1l. 0s. 3d.

3. If $\frac{1}{2}$ of $\frac{3}{4}$ of a lb. of tea be worth $\frac{1}{3}$ of $\frac{1}{8}$ of 13s.; what are $31\frac{1}{9}$ lbs. worth? Anſ. 2l. 5s. $6\frac{3}{4}\frac{2}{11}$d.

4. If $3\frac{4}{9}$ acres be worth $3_{11}\frac{7}{11}$l.; what are $15\frac{1}{8}$as. worth? Anſ. 15l. 15s. $6\frac{3}{4}\ {}_{11}\frac{3}{11}$d.

5. If $\frac{1}{8}$ of a ſhip be worth 73l. 18s. 3d.; what part of her may I buy for $250\frac{1}{2}$l.? Anſ. $\frac{1}{7}$.

6. How many pieces of cloth at $20\frac{1}{8}$s. per piece, are to be given for $240\frac{1}{7}$ pieces, at $12\frac{1}{2}$s. per piece?

Anſ. $149_{11}\frac{1}{11}\frac{7}{7}$.

7. At $1\frac{1}{4}$l. per cwt., what do $3\frac{1}{3}$lbs. come to?

Anſ. $10\frac{5}{7}$d.

8. If when the days are $13\frac{5}{8}$ hours long, a traveller performs his journey in $35\frac{1}{4}$ days; in how many days will

will he perform the ſame journey when the days are $11\frac{9}{10}$ hours long? Anſ. $40\frac{61}{91}\frac{5}{2}$.

9. If $\frac{1}{3}$lb. leſs by $\frac{1}{8}$ coſt $13\frac{1}{3}$d.; what coſt 14lbs. leſs by $\frac{1}{7}$ of 2lbs.? Anſ. 4l. 10s. 8d.

10. What muſt be paid for $5\frac{3}{9}$ozs. at the rate of $5\frac{1}{4}$s. per lb. troy? Anſ. 2s. $6\frac{1}{10}$d.

11. If 13 men in $11\frac{3}{7}$ days mow $21\frac{1}{2}$ acres of graſs; in how many days will 8 men do the ſame?

Anſ. 18 $\frac{21}{44}$ days.

12. How much ſhalloon, $\frac{3}{4}$ of a yard broad, will line a coat, containing $3\frac{1}{2}$ yds. of cloth $\frac{7}{8}$ of a yd. broad?

Anſ. $4\frac{1}{2}$ yds.

13. If $8\frac{1}{2}$ cwts. of ſugar coſt $25\frac{7}{10}$l.; what does a loaf of it come to weighing $17\frac{9}{10}$ lbs.?

Anſ. 9s. $5\frac{1}{4}$ $\frac{6}{3}\frac{6}{0}\frac{8}{0}$d.

REMARK.

By obſerving the rules already given, and the rules given in common Arithmetic, you may perform the rule of five, intereſt, diſcount, barter, loſs and gain, fellowſhip, or exchange, by vulgar fractions. Examples of each of theſe would only ſwell the book, and may eaſily be ſupplied from the former part of the work.

DECIMAL FRACTIONS.

A Decimal fraction is a fraction whoſe denominator is an unit, with one or more ciphers annexed to it.

Decimal fractions are expreſſed without any denominators, by writing down the numerator, and putting a point before it, at the top of the figure; thus, $\frac{5}{10}$ is written ·5, and $\frac{55}{100}$, ·55.

Ciphers put on the right hand of a decimal fraction do not alter its value; but when they are put on the left hand of a ſignificant figure, every cipher decreaſes its value in a tenfold proportion.

The firſt figure on the right hand of a decimal point is called tenths, or the tenth part of an unit; the ſecond, hundredths; the third, thouſandths; the fourth, tens of thouſandths, &c.; as, 7·4, is read, 7 and 4 tenths; 6·35, is read, 6 and 3 tenths 5 hundredths, or 6 and 35 hundredth parts; and ·215, is read, 2 tenths 1 hundredth and 5 thouſandths, or 215 thouſandth parts.

A finite or terminate decimal ends at ſome certain number of places; *an infinite decimal* has no end.

A repeating or recurring decimal is a decimal wherein the ſame figure is repeated as often as you chuſe; as, ·4444, &c.; the firſt figure of which ought to have a dot over it, or a daſh through it.

A circulating decimal is when more than one figure is repeated; as, ·638463846384, &c.; where both the firſt and laſt figures of the repetend ſhould have dots over them.

REMARK.

Some accountants mark off decimals with a comma; thus, 4,5—6,08—3,72; others with a period at the bottom of the figure; thus, 7.2,—8.07,—9.28; and others in the way before directed. I have given the preference to the laſt method, becauſe, by it, the diſtinction is ſo clear between the decimal points and the ſtops, that they cannot be miſtaken for one another.

ADDITION of DECIMALS.

RULE.

Write the numbers under each other, ſo that the decimal points may ſtand in one column. Draw a line under them, and add them as whole numbers. Then, point off as many places, for decimals, as are equal to the greateſt number of decimal places in any line of the queſtion.

EX-

EXAMPLES.

1. What is the sum of 41·7164,—61·4182,—7·4187,—3874·,—and 6·8768?

41·7164
61·4182
7·4187
3874·
6·8768

3991·4301 Anſ.

2. Required the ſum of ·0718,—4·7141,—·2181,—4·3714,—·0075,—3·75 and 2187·? Anſ. 2200·1329.

3. Add ·4718,+·0718,+41·75,+·675,+·075,+·0718 into one ſum. Anſ. 43·1154.

4. I demand the ſum of 4·714,—·0081,—·000714,—481·75,—4·181—and ·007? Anſ. 490·660814.

5. Add 61·71, + 1·718, + 4·718, + 1·714, + 71·,+ 187·41,+11·75 into one ſum. Anſ. 340·02.

6. Find the ſum of four tenths ſeven hundredths one thouſandth, or 471 thouſandths,—·1718,—171 and forty five hundredths,—87·11,—11 and 718 thouſandths, and 17·18. Anſ. 288·1008.

7. What is the ſum of 3 and forty eight hundredth parts, 7 and nine tenths, 11 and four thouſandth parts, 68 and five million parts, and 41 and 8 tenths?

Anſ. 132·184005.

SUBTRACTION of DECIMALS.

RULE.

Place the numbers as directed in Addition; draw a line under them, and ſubtract by the rule for ſimple quantities, taking care to place the decimal point in the ſame column with the points in the queſtion.

EXAMPLES.

1. From 61·7145 subtract 11·17161.

61·7145
11·17161

50·54289 Anſ.

2. Subtract 3·7187 from 10·. Anſ. 6·2813.
3. From ·171087 deduct ·00876. Anſ. ·162327.
4. Let 11·75 be taken from 100·. Anſ. 88·25.
5. From 41·7187 take 4·17187. Anſ. 37·54683.
6. From ·071871 deduct ·020875. Anſ. ·050996.
7. Subtract 2 and 755 thouſandth parts from 6 and 82 hundredths. Anſ. 4·065.
8. From 871 and 75 hundredth parts take 11·1875. Anſ. 860·5625.

MULTIPLICATION of DECIMALS.

RULE.

Place the factors in ſuch a manner that the decimal points may ſtand in one column; draw a line under them and multiply as in whole numbers. Then, reckon as many places for decimals as there are decimals contained in both factors; and if there are not ſo many places you muſt ſupply the defect by prefixing ciphers.

EXAMPLES.

1. Multiply 67·456 by 2·75.

67.456
2·75

337280
472192
134912

185·50400 Anſ.

2. Mul-

2. Multiply 41·318 by ·7854. Anſ. 32·4511572.
3. Multiply 3·75 by ·375 Anſ. 1·40625.
4. Multiply ·2173 by ·1782. Anſ. ·03872286.
5. What is the product of ·3872 and ·07375. Anſ. ·028556.
6. Required the product of 5·75 multiplied by ·00375? Anſ. ·0215625.
7. Multiply 1708· by ·00085. Anſ. 1·4518.
8. Multiply 27·315 by ·0007154. Anſ. ·019541151.
9. The diviſor is 11·35 and the quotient is ·3825; what is the dividend? Anſ. 4·341375.
10. What is the product of ·002535 and ·01675? Anſ. ·00004246125.

CONTRACTED MULTIPLICATION of DECIMALS.

In working Multiplication of decimals, you may make the product contain what number of decimal places you chuſe, by obſerving the following

R U L E.

Write the multiplier under the multiplicand, but in a contrary order to what is uſually done, ſetting the units place in the multiplier under the laſt figure in the multiplicand which you wiſh to reſerve in the product. Then, draw a line under them, and multiply as before; obſerving to reject all the figures that ſtand to the right of the figures you multiply by, and to place the products ſo that their right hand figures may ſtand in one column. But when you multiply the figures you reject, carry one at 5, two at 15, three at 25, four at 35, &c.

EXAMPLES.

1. Multiply 37·1818 by 48·7214, and leave four places of decimals in the product.

37·1818			37·18189	
48·7214			4127·84	
148 7272			14872720	
371 818			2974544	
7436 36			260273	
26 0272 6		Common way.	7436	Contracted way.
297 4544			372	
1487 272			149	
1811·5493	5052		1811 5494	

2. Multiply 274·8768 by 187·3795, and reserve four places of decimals in the product.—Anſ. 51506·2773.

3. Let 37·46305 be multiplied by 1·71076, and let five places of decimals be reserved in the product.

Anſ. 64·09029.

4. Multiply 4·17125 by 6·1305, and reserve 5 places of decimals in the product. Anſ. 25·57186.

5. Let 41·6742 be multiplied by 37·3768, and reserve three, two, and one place of decimals in the product.

Anſ. 1557·647,—1557·65, and 1557·6.

6. Multiply 67·3872 by 11·714786, and reserve four places of decimals in the product. Anſ. 789·4267.

DIVISION of DECIMALS.

RULE.

Perform the operation exactly as in ſimple quantities, obſerving particularly to point off as many places for decimals in the quotient, as the dividend has more than the diviſor. But if the quotient has not the number of figures wanted, make up the number by putting a cipher

cipher or ciphers on its left hand. If the decimal places in the divisor be more than those in the dividend, or if there be a remainder after division, add ciphers to the dividend and continue the work as far as you see necessary.

NOTE.

When you have continued the operations as far as you think proper, if a remainder be left, and if it be less than half the divisor, mark the quotient with +; but if it be more than half the divisor, increase the last figure in the quotient with an unit, and mark it with—. —This method of treating decimals is called *approximation*.

EXAMPLES.

1. Divide 614·718 by 4·3796.

4·3796)614·7180000(140·359+ Anf.
43796
176758
175184
157400
131388
260120
218980
411400
394164
17236 Rem.

2. Divide 27·187 by 4·61375. Anf. 5·892604—.
3. Divide 412.387 by 38·7164. Anf. 10·6515—.
4. Divide 48 by 144. Anf. ·33333.
5. Divide 26 by 128. Anf. ·203125.
6. Divide ·27142 by ·06875. Anf. 3·94793—.
7. Divide ·6745 by ·006138. Anf. 109·889215.

8. Divide

8. Divide 27·101 by 1728. Anſ. ·015683+.
9. Divide ·02718 by 485·687.—Anſ. ·00005596+.
10. Divide ·000718 by ·01856. Anſ. ·0387—.

CONTRACTED DIVISION of DECIMALS.

Operations in diviſion of decimals may be much ſhortened, and the quotient limited to any given number of decimal places, by obſerving the following

RULE.

Find the value of the firſt figure in the quotient, which you may do by obſerving that it will be of the ſame value with that figure of the dividend which ſtands over the units place of the firſt product in working the diviſion. This will lead you to know how many figures in the dividend will be wanted to complete the anſwer. Make a mark over that decimal figure in the diviſor which will be equal in diviſion to the figures wanted in the dividend, and find how many times the diviſor is contained in the dividend, rejecting thoſe figures in the diviſor which ſtand on the right hand of the mark you made. Let each remainder be a new dividend, and divide as before, only dropping a figure in the diviſor at every operation, and carrying for all the figures you drop, when you multiply them, as directed in the rule for contracted multiplication of decimals. If the dividend or diviſor has too few figures, add ciphers as you ſee neceſſary.

EX-

EXAMPLES.

1. Divide 721·17562 by 2·257432, and let there be only three places of decimals in the quotient.

Common Way.

```
2·257432)721·17562000000(319·467+
         677229 6
         ---------
          ·43946 02
            22574 32
          ---------
            21371 700
            20316 888
          ---------
             ·1054 8120
               902 9728
          ---------
              ·151 83920
               135 44592
          ---------
               ·16 393280
                15 802024
          ---------
                .. 591256 Remainder.
```

Contracted way.

```
2·257432)721·17562(319·467 Anſ.
         677230
         ------
          ·43945
            22574
          ------
            21371
            20317
          ------
             ·1054
               903
          ------
              ·151
               136
          ------
               ·15
                15
          ------
                ..
```

2. Divide

2. Divide 61·41872 by 12·8718275, and let there be 4 places of decimals retained in the quotient.
Anſ. 5·1735.

3. Divide 21·7102 by 8·68759, and reſerve 3 places of decimals in the quotient. Anſ. 2·499.

4. Divide 417·281 by 12·91641, and let the quotient contain 2 places of decimals. Anſ 32·31.

5 Divide 165·9923 by 52·7438, and reſerve 2 places of decimals in the quotient. Anſ. 3·14.

REDUCTION of DECIMALS.

CASE I.

To reduce a vulgar fraction to a decimal of the ſame value.

RULE.

Annex ciphers to the numerator and divide it by the denominator; continuing the operation as far as you ſee neceſſary, and the quotient will be the decimal required.

EXAMPLES.

1. Reduce $\frac{5}{16}$ to its equivalent decimal.

16)5·0000(·3125 Anſ.
48
·20
16
·40
32
·80
80
··

2. Re-

2. Reduce $\frac{7}{10}$, $\frac{6}{14}$, and $\frac{11}{175}$ to equivalent decimals.

Anſ. ·7777, ·4285714, and ·299465+.

3. Reduce $\frac{1}{7}$ of $\frac{1}{6}$ of $\frac{8}{10}$ to its equivalent decimal.

Anſ. ·22222.

4. Reduce $\frac{1}{9}$ of $\frac{1}{4}$ of $\frac{1}{8}$ of 7, and $\frac{1}{11}$ of $\frac{1}{12}$ of $\frac{1}{11}$ of 65 to equivalent decimals.

Anſ. ·0243055, and ·027636+.

5. Expreſs $\frac{6}{7}$ of $\frac{8}{9}$, and $\frac{7}{8}$ of $\frac{1}{10}$ of 17 decimally.

Anſ. ·7619+, and 1·4875.

6. Let $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{2}{3}$ be reduced to decimals.

Anſ. ·25,—·5,— ·333,—·75,—·8333, and ·6666.

CASE II.

To reduce a decimal to its equivalent vulgar fraction.

RULE.

If the decimal be *a finite one;* make it the numerator, and 1, with as many ciphers as the decimal contains figures, the denominator. If the decimal be a *repetend* or a *circulate;* make the repeating figure or figures the numerator, and the denominator will be as many nines as there are repeating figures in the decimal. If there be a finite part before the repetend or circulate; ſubtract the finite part from the whole mixed decimal, and the remainder will be the numerator, and the denominator will be 9 for each circulating figure with a cipher on the right hand for each finite decimal.

EXAMPLES.

1. Reduce ·375,—$\dot{4}$,—·345345,—and ·37242424 to equivalent vulgar fractions.

$\cdot 375 = \frac{375}{1000} = \frac{3}{8}$,—$\dot{4} = \frac{4}{9}$,—$\cdot\dot{3}45\dot{3}45 = \frac{345}{999} = \frac{115}{333}$.

$$\begin{array}{r} \cdot 3724 \\ 37 \\ \hline 3687 \\ \hline 9900 \end{array} = \cdot 37\dot{2}4\dot{2}4\dot{2}4.$$

2. Re-

2. Reduce ·4175 to its equivalent vulgar fraction.
Anſ. $\frac{167}{400}$.

3. What vulgar fraction is equivalent to ·842?
Anſ. $\frac{421}{500}$.

4. Required the vulgar fraction equivalent to ·3333.
Anſ. $\frac{1}{3}$.

5. Find the equivalent vulgar fraction to ·185185185.
Anſ. $\frac{185}{999}$.

6. Let ·14333 be reduced to an equivalent vulgar fraction. Anſ. $\frac{43}{300}$.

7. Reduce ·31275275 to its equivalent vulgar fraction.
Anſ. $\frac{7811}{24975}$.

CASE III.

To reduce money, weights, meaſures, &c. to equivalent decimals.

RULE.

If the quantity given be of but one denomination; divide it by as many as make one of the denomination ſought, and the quotient will be the decimal required. —But if the quantity given be of more than one denomination; reduce it to the loweſt name mentioned for a dividend, and reduce the integer to the ſame name for a diviſor, and find the quotient as before, which will be the anſwer.

NOTE.

Different denominations may alſo be reduced to decimals of a ſpecified integer, by placing the given names one under another, regularly from the leaſt to the greateſt, for dividends, and dividing theſe by their reſpective integers. Then, the laſt quotient will be the decimal required.

EX-

EXAMPLES.

1. Reduce 5s. $5\frac{1}{4}$d. to the decimal of a pound.

By the rule.

£.	s.	d.	
1	5	$5\frac{1}{4}$	
20	12		
20	65		
12	4		
240	96,0)	263·00,0(	·274—Anf.
4		192	
960		·710	
		672	
		·380	
		384	

By the note.

4	3·00000
12	5·75000
2,0	5·4791,6
	·273958 Anf.

2. Reduce 8s. $4\frac{1}{2}$d. to the decimal of a pound.
Anf. ·41875.

3. Reduce $7\frac{1}{2}$d. to the decimal of a ſhilling.
Anf. ·625.

4. Reduce 9s 6d. to the decimal of a guinea.
Anf. ·45238+.

5. Reduce 10 ozs. 11 dwts. 18 grs. to the decimal of a lb. troy. Anf. ·3805.

6. Reduce 9 dms. to the decimal of a lb. avoirdupoiſe.
Anf. ·03515625.

7. Reduce 16 lbs. to the decimal of a cwt.
Anf. ·142857.

8. Reduce ·056 poles to the decimal of an acre.
Anf. ·00035.

9. Reduce 3 qrs. 2 ns. to the decimal of a yard.
Anf. ·875.

10. Reduce 2·4 pts. of wine to the decimal of a hhd.
Anſ. ·0047619.

11. Reduce 3 bls. 1 pk. to the decimal of a qr.
Anſ. ·40625.

12. Reduce 3 mos. 2 wks. 6 ds. to the decimal of a year. Anſ. ·3095238+.

CASE IV.

To find the proper value of a decimal fraction.

RULE.

Multiply the decimal by the number of parts in the next lower denomination, and point off as many decimal figures as were given. Reduce the remainder to the next lower denomination, and point off the decimals as before. Proceed in this manner till you have gone through all the parts of the integer, and the ſeveral ſums cut off, on the left hand, will be the anſwer.

EXAMPLES.

1. Find the value of ·4165 of a pound.

·4165		
20		
8·3300		
12		
3·9600		
4		
3·8400	Anſ.	*s.* *d.* 8 3½ ·84.

2. What is the value of ·984375 of a pound?
Anſ. 19s. 8¼d.

3. What is the value of ·72708 of a moidore?
Anſ. 19s. 7½d. ·296.

4. What

4. What is the value of ·55 of ·8 of ·275 of a pound?
Anſ. 2s. 5$\frac{2}{4}$d. ·2.

5. What is the value of ·6725 of a cwt.?
Anſ. 2 qrs. 19 lbs. 5 ozs. ·12.

6. Find the value of ·56875 of an acre.
Anſ. 2 rs. 11 ps.

7. Required the value of ·009943 of a mile?
Anſ. 17 yds. 1 ft. 5·988+ins.

8. What is the value of ·29365 of a hhd. of wine?
Anſ. 18 gs. 2 qts. +

9. Find the value of ·5625 of a qr. of corn.
Anſ. 4 bls. 2 pks.

10. What is the value of ·461 of a chaldron of coals?
Anſ. 16 bls. 2 pks. ·384.

11. Required the value of ·42857 of a month?
Anſ. 1 wk. 4 ds. 23·999+hs.

REMARK.

You may add, ſubtract, multiply and divide compound quantities decimally, by reducing the propoſed parts to decimals of the ſame name, and then proceeding by the foregoing rules.

The RULE of THREE in DECIMALS.

RULE.

Prepare the terms by reducing vulgar fractions to decimals, and compound quantities either to decimals of their higheſt name, or to integers of their loweſt. Then, ſtate the queſtion and proceed as in whole numbers, only obſerving that due regard be had to placing the decimal points by the rules already given.

EXAMPLES.

1. If 1·5 ounce of silver be worth 7·8s.; what is the worth of 9·7lbs.?

oz.	lb.		lb.	£.	lbs.
1·5 =	·125	As	·125	: ·39 : :	9·7
s.	£.				·39
7·8 =	·39				873
					291

·125)3·783000(30·264 £.
375
·330 5·280
250 12
·800 3·360
750 4
·500 1·440
500

	£.	s.	d.
Anf.	30	5	3¾ ·44.

2. If $\frac{1}{8}$ of a ship be worth 418l. 12s.; what is $\frac{2}{3}$ of the same ship worth? Anf. 223l. 5s. 0¾d. +.

3. If I pay 3s. 9d. for 2½ yards of linen; what must I pay for 38¾ yards at the same rate?

Anf. 2l. 18s. 1½d.

4. If 12¼ yards of cloth cost 2l. 8s. 10¼d; what is one yard worth? Anf. 3s. 11½d. +.

5. An ounce of silver is worth 5s. 6½d; what is the value of 1 lb. 8 ozs 11 dwts. 16 grs.?

Anf. 5l. 14s. 0¾d. +.

6. What are 4 cwts. 3 qrs. 11 lbs. of cheese worth, at 1l. 17s. 8d. per cwt.? Anf. 9l. 2s. 7¼d.

7 If 3s. 7½d. will pay carriage for 1 m. 2 fgs. 17⅛ yds.; how far will the same weight be carried for 17l. 16s. 4d.? Anf. 123ms. 6fgs. 134yds. 2ft. +.

8. My

8. My wages for $\frac{1}{6}$ of a day is 2s. $1\frac{1}{4}$d.; how much is that for $\frac{7}{8}$ of a week? Anſ. 1l. 10s. $6\frac{1}{4}$d.

9. If I buy 14 yards of cloth for 10 guineas; how many ells Flemiſh can I buy for 283l. 17s. 6d.?

Anſ. 504 ells Fl. 2 qrs.

10. Goliath is ſaid to have been 6 cubits and a half, or a ſpan, high; this anſwers to 10 feet 4 ins and $\frac{74}{121}$. Pray what was the length of the cubit in our meaſure?

Anſ. 1 ft. 7 ins. ·168.

11. How many gallons of brandy may be purchaſed for 100l. 15s. at 50 guineas per puncheon?

Anſ 161 galls. ·2.

12. If the two-penny loaf weighs 6lbs 4 ozs., when wheat is 6s. per buſhel; what ſhould it weigh when wheat is 5s. 6d. per buſhel?

Anſ. 6lbs. 13 ozs. +

13. John owes Joſeph 296·85l, but he compounds for 7·5s per pound; what muſt Joſeph receive for his debt? Anſ. 111l. 6s. $4\frac{1}{2}$d.

14. How much ſtuff that is $\frac{1}{8}$ yd. wide, will line $20\frac{1}{2}$ yds. of cloth that is $\frac{7}{8}$ yd. wide?

Anſ. 47 yds. 3 qrs. 1 n. ·33.

15. A farmer pays 17s. 6d. per acre for his farm, conſiſting of 264 as. 3rs.; what is his yearly rent?

Anſ. 231l. 13s. $1\frac{1}{2}$d.

FELLOWSHIP in DECIMALS.

RULE.

Divide the whole gain, loſs or money to be parted, by the ſum of the ſhares, or by the ſum of the products of the ſhares and times, (as the queſtion may require) and multiply the quotient by each man's particular ſhare, or product of his ſhare and time, and the laſt products will be the ſhares required.

REMARK.

This rule is properly a contraction of fellowſhip in integers, but may be worked much more conveniently by decimals than whole numbers, on account of remainders which ſometimes occur after the diviſion, and which may be eaſily managed by turning them into decimals.

EXAMPLES.

1. John, Thomas and George trade together. John put into ſtock 36l. Thomas 48l. and George 60l. They gain by trade 72l.; how muſt it be be divided amongſt them?

£.	£.	£.
36 John's ſtock	48	60
48 Thomas's ſtock	·5	·5
60 George's ſtock		
	£. 24·0 Thos's gain	£. 30·0 Geo.'s gain
144 the whole ſtock		

144)72·0(·5
72 0
...

Anſ. £. 18 John's gain, 24 Thomas's gain, 30 George's gain

72 Proof.

£. 36 ·5

£. 18·0 John's gain

2. Three perſons make a joint ſtock. Edward puts in 250l. William 150l. and Robert 100l. and the gain, in one year, is 150l.; how muſt it be divided amongſt them?—Anſ. Edward muſt have 75l. William 45l. and Robert 30l.

3. John, Joſeph, Edmund and Henry ſpent 30l. and agree that John ſhall pay $\frac{1}{3}$ of it, Joſeph $\frac{1}{5}$, Edmund $\frac{1}{4}$, and Henry $\frac{1}{2}$; what are their ſhares?—Anſ. John muſt

pay

pay 11l. 13s. 9$\frac{2}{4}$d. ·73+, Joſeph muſt pay 7l. 15s. 10$\frac{0}{4}$d. ·51+, Edmund muſt pay 5l. 16s. 10$\frac{1}{4}$d. ·38+, and Henry muſt pay 4l. 13s. 6$\frac{0}{4}$d. ·31+.

4. Robert, Thomas and Jacob rent a farm for 60l. per annum. Robert puts in 30 oxen for 3 months, Thomas 27 oxen for 4 months, and Jacob 35 oxen for the remainder of the year; how much muſt each man pay of the rent?—Anſ. Robert muſt pay 14l. 9s. 6$\frac{1}{4}$d. ·13—,Thomas muſt pay 17l. 7s. 5$\frac{1}{4}$d. ·75—and Jacob muſt pay 28l. 3s. 0$\frac{0}{4}$d ·14—.

5. Three merchants join in trade. A puts in 100l. for 9 months, B, 170l for 7 months, and C, 210l. for 11 months, and they loſe 350l in trade; what part of the loſs muſt each man ſuſtain?—Anſ. A muſt loſe 71l. 11s. 9$\frac{1}{4}$d. ·31—, B muſt loſe 94l. 13s. 2$\frac{0}{4}$d. ·77—and C muſt loſe 183l. 15s. 0$\frac{0}{4}$d. ·1—.

REMARK.

The double rule of three, intereſt, diſcount, equation of payments and all the other rules of arithmetic may be performed decimally, by obſerving the directions given with reſpect to each particular rule, and by working the decimals as has been already taught. Several curious methods might be given to perform the above named articles by, but they are of little or no uſe in buſineſs.

EXTRACTION of the SQUARE ROOT.

EXTRACTING the ſquare root is the finding out ſuch a number, as, being multiplied by itſelf, will produce the given number.

NOTE.

1ſt. Extracting of roots is commonly called *evolution*; and when any number is ſquared, cubed, &c. it is ſaid to be *involved*, and the proceſs is diſtinguiſhed by the name of *involution*.

2d. When

2d. When the root of any number can be taken without a remainder, the number is called *a complete power*, and its root is called *a rational root*; but when there is a remainder after extraction, the number is called *an imperfect power*, and its root *a surd*.

A TABLE of SQUARES and CUBES.

Roots.	1	2	3	4	5	6	7	8	9
Squares.	1	4	9	16	25	36	49	64	81
Cubes.	1	8	27	64	125	216	343	512	729

C A S E I.

To extract the square root of integers, or decimals, or both mixed together.

R U L E.

Distinguish the given number into periods of two figures each by points set over it, beginning at the units place in whole numbers, and make the number of decimal places even by adding a cipher when wanted.—Then, find a square number either equal to, or the next less than the first period, which subtract from it, and place the root in the quotient for the first figure of the answer. To the remainder annex the second period for a dividend; and on the left hand thereof write the double of the root already found for a divisor, leaving the units place open. Find how often the divisor is contained in the dividend, wanting the last figure on the right hand; place that number in the quotient, and on the right hand of the divisor; multiply the whole divisor by it; place the product below the dividend and subtract it from it. To this remainder bring down the next period; find a divisor to it, and a root for it, as in the last article; and continue the operation still in the same manner, till all the periods are brought down.

NOTE.

NOTE.

1ſt. The anſwer will contain as many figures as there are points put over the given number, whether you extract the ſquare, cube, or any other root.

2d. After going through all the figures given in the queſtion, if a remainder be left you may continue the work as far as you pleaſe, by annexing ciphers to the remainder, by two at a time in the ſquare root, three in the cube root, &c.

3d. When the root is to be extracted to a great number of places, the operation may be much ſhortened; thus: Work, by the common method, till you have found more than half the required number of figures in the root; then the reſt may be found by dividing the laſt remainder by its correſponding diviſor, annexing a cipher to the dividend after each diviſion, or dropping a figure from the right hand of the diviſor every time you divide.

EXAMPLES.

1. What is the ſquare root of 105625?

```
105625(325 Anſ.        325
  9                    325
 ---                  ----
62)156                1625
   124                 650
 ----                 ----
645)3225              975
    3225             ------
    ----  Proof      105625
    ....             ======
    ----
```

2. What is the ſquare root of 32649796?
Anſ. 5714.
3. Find the ſquare root of 5499025.—Anſ. 2345.
4. Extract the ſquare root of 36372961.
Anſ. 6031.
5. What is the ſquare root of 17486·597?
Anſ. 132·23+.

6. Find

6. Find the ſquare root of 9712·718051.
Anſ. 98·553+.

7. What is the ſquare root of 19·070689?
Anſ. 4·367.

8. Let the ſquare root of ·000954216 be found.
Anſ. ·03089+.

9. What is the ſquare root of 4·372594?
Anſ. 2·091+.

10. Extract the ſquare root of 15.
Anſ. 3·872983+.

11. What is the ſquare root of ·05821643?
Anſ. ·2413—.

12. Find the ſquare root of 5 to 6 places of decimals.
Anſ. 2·236068—.

13. Required the ſquare root of 4·000067121?
Anſ. 2·000016+.

14. What is the ſquare root of 7?
Anſ. 2·645751+.

15. Suppoſe the content of a ſquare field is 27·5625 ſquare chains; what length is one of its ſides?
Anſ. 5·25 chs.

CASE II.

To extract the ſquare root of vulgar fractions or mixed numbers.

RULE.

Reduce the given vulgar fraction to its loweſt terms, and then extract the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator. But, if the fraction be a ſurd, reduce it to a decimal and extract its root by caſe 1ſt.

Mixed numbers may either be reduced to improper fractions and their roots taken as ſuch; or elſe (if they are ſurds) be reduced to decimals and then extracted.

EX-

EXAMPLES.

1. What is the square root of $\frac{144}{2500}$?

$\frac{144}{2500} = \frac{16}{25}$

16(4	25(5
16	25
..	..

Anf. $\frac{4}{5}$.

2. I demand the square root of $\frac{225}{324}$? Anf. $\frac{5}{6}$.
3. Find the square root of $\frac{2401}{4096}$. Anf. $\frac{7}{9}$.
4. What is the square root of $\frac{1827}{3600}$?—Anf. ·72414+.
5. Required the square root of $\frac{5}{8}$?—Anf. ·790569.
6. Find the square root of $\frac{10}{24}$. Anf. ·645497+.
7. Extract the square root of $17\frac{6}{25}$. Anf. $4\frac{1}{5}$.
8. What is the square root of $10\frac{10}{49}$? Anf. $3\frac{2}{7}$.
9. I demand the square root of $20\frac{1}{4}$? Anf. $4\frac{1}{2}$.
10. What is the square root of $76\frac{4}{7}$?

Anf. 8·7649+.

11. Extract the square root of $6\frac{2}{3}$.—Anf. 2·5298+.
12. Find the square root of $9\frac{1}{2}$ Anf. 3·0822+.

CASE III.

To find a mean proportional between two given numbers.

RULE.

Multiply the two given numbers together, and extract the square root of the product, which root will be the mean proportional fought.

EXAMPLES.

1. What is the mean proportion between 16 and 36?

36	576(24 Anf.
16	4
216	44)176
36	176
576	...

As 16 : 24 :: 24 : 36 Proof.

2. Find

2. Find the mean proportional between 2 and 5.
Anſ. 3·162278—.

3. What is the mean proportional between 67 and 124?
Anſ. 91·14823+.

4. Required the mean proportional between 8 and 17?
Anſ. 11·6619+.

CASE IV.

To find the ſide of a ſquare equal in area to any given ſuperficies.

RULE.

Extract the ſquare root of the given ſuperficies, which root will be the ſide of the ſquare ſought.

EXAMPLES.

1. The area of a given triangle is 870·25 yards; I demand the ſide of a ſquare equal in area thereto?

870·25(29·5 Anſ.
4

49)470
441

585)2925
2925

29·5
29·5

1475
2655
590

870·25 Proof.

2. If the area of a given circle is 1315·6 feet; what is the ſide of a ſquare whoſe area is equal thereto?
Anſ. 36·274.

3. An oval fiſh-pond contains 9 as. 3 rs. 21 ps.; required the ſide of a ſquare fiſh-pond that ſhall contain the ſame quantity of land? Anſ. 218·6898+ yds.

CASE V.

Any two ſides of a right-angled triangle being given to find the remaining ſide.

RULE.

R U L E.

If the hypothenuſe or longeſt ſide be required; extract the ſquare root of the ſum of the ſquares of the two given ſides, which root will be the hypothenuſe ſought. But, if either of the other two ſides be wanted; extract the ſquare root of the difference of the ſquares of the given ſides for the anſwer.

E X A M P L E S.

1. The two ſhorteſt ſides of a right-angled triangle are 23 and 27 yards; required the hypothenuſe or longeſt ſide?

		yds.
23	27	1258(35·47—Anſ.
23	27	9
69	189	65)358
46	54	325
529	729	704)3300
	529	2816
	1258	7087)48400
		49609

2. The hypothenuſe of a right-angled triangle is 50, and its baſe 40 feet; required its perpendicular?

Anſ. 30 feet.

3. A line of 320 feet will reach from the top of a rock, ſtanding cloſe by the ſide of a brook, to the oppoſite bank; required the breadth of the brook; the height of the rock being 103 feet?

Anſ. 302·9703 — feet.

4. The baſe of a right-angled triangle is 77, and the perpendicular 36 yards; what is the hypothenuſe?

Anſ. 85 yards.

5. A ladder 40 feet long may be ſo planted, that it ſhall reach a window 33 feet from the ground on one

ſide of the ſtreet; and, without moving it at the foot, will do the ſame by a window 21 feet high on the other ſide; the breadth of the ſtreet is required?

Anſ. 56·64+ feet.

REMARK.

The three laſt caſes ſhew ſome of the many uſes to which the ſquare root is applicable. It may alſo be applied to many other purpoſes which are quite foreign to a courſe of Arithmetic.

EXTRACTION of the CUBE ROOT.

Extracting the cube root is, the finding out a number, which being multiplied into itſelf, and then again into the product, will produce the given number.

CASE I.

To extract the cube root of integers, or decimals, or both mixed together.

RULE.

Separate the given number into periods of three figures each, by putting a point over every third figure from the place of units, and make the decimals conſiſt of three, ſix, or nine, &c. places, by annexing one or more ciphers if neceſſary. Then, ſeek the greateſt cube in the left hand period, write the root in the quotient, and the cube under the period, from which ſubtract it. To the remainder annex the next period, and call the whole ſum the *reſolvend*. Under this reſolvend, write the triple ſquare of the root, ſo that units in the latter may ſtand under the place of hundreds in the former; and under the ſaid triple ſquare write the triple root, removed one place to the right hand, and the ſum of theſe two lines call a *diviſor*.

Seek

Seek how often this diviſor may be had in the reſolvend, its right hand place excepted, and write the reſult in the quotient. Under the diviſor write the product of the triple ſquare of the root by the laſt quotient figure, ſetting the units place of this line, under that of tens in the diviſor; under this line, write the product of the triple root by the ſquare of the laſt quotient figure, let this line be removed one place beyond the right hand of the former; and under this line, removed one place forward to the right hand, write the cube of the laſt quotient figure. Call the ſum of theſe three lines the *ſubtrahend*, which ſubtract from the reſolvend, and to the remainder bring down the next period for a new reſolvend, with which proceed as before, and ſo on till the whole is finiſhed.

EXAMPLES.

1. What is the cube root of 99252847?

99252847(463 Anſ.	463
64	463
35252 Reſolvend	1389
	2778
48 =4×4×3	1852
12=4×3	
	214369
492 Diviſor	463
288 =48×6	643107
432 =12×6×6	1286214
216=6×6×6	857476
33336 Subtrahend	99252847 Proof.
1916847 Reſolvend	
6348 =46×46×3	
138 =46×3	
63618 Diviſor	
19044 =6348×3	
1242 =138×3×3	
27=3×3×3	
1916847 Subtrahend.	

2. I demand the cube root of 74088? Anſ. 42.
3. What is the cube root of 1092727? Anſ. 103.
4. Required the cube root of 5735339? Anſ. 179.
5. Extract the cube root of 27054036008. Anſ. 3002.
6. Find the cube root of 673373097125. Anſ. 8765.
7. What

7. What is the cube root of 36155·027576?
Anſ. 33·07—

8. I demand the cube root of ·121861281?
Anſ. ·495+

9. Extract the cube root of 15926·972504.
Anſ. 25·16+

10. Required the cube root of ·0019066624?
Anſ. ·124+

11. What is the cube root of 179·58230164?
Anſ. 5·641+

CASE II.

To extract the cube root of vulgar fractions or mixed numbers.

RULE.

The fraction being reduced to its loweſt terms, extract the cube root of the numerator, for a new numerator, and of the denominator, for a new denominator.

Mixed numbers may be reduced either to improper fractions or decimals, and then extracted.

NOTE.

If the given fraction, or mixed number, be an imperfect power, it muſt be reduced to a decimal and then be extracted.

EXAMPLES.

1. What is the cube root of $\frac{250}{686}$?

$\frac{250}{686}=\frac{125}{343}$ 125(5 343(7 Anſ. $\frac{5}{7}$.
125 343
... ...

2. I demand the cube root of $\frac{27}{64}$? Anſ. $\frac{3}{4}$.
3. What is the cube root of $\frac{648}{1000}$? Anſ $\frac{9}{10}$.
4. Find the cube root of $\frac{1}{9}$. Anſ. ·822+
5. Required the cube root of $\frac{1}{2}$? Anſ. ·90855+.
6. What is the cube root of $\frac{1}{3}$? Anſ. ·693+.

7. Find the cube root of $405\frac{29}{125}$. Anſ. $7\frac{2}{5}$.
8. What is the cube root of $5\frac{1}{14}\frac{1}{3}$? Anſ. $1\frac{5}{7}$.
9. Extract the cube root of $8\frac{5}{7}$. Anſ. 2·057+.
10. I demand the cube root of $7\frac{1}{2}$? Anſ. 1.966+.
11. Find the cube root of $3\frac{1}{5}$. Anſ. 1·4735+.

CASE III.

To find the ſide of a cube that ſhall be equal in ſolidity to any given ſolid.

RULE.

Extract the cube root of the ſolid content of the given body, which root will be the ſide of the cube required.

EXAMPLES.

1. The ſolid content of a given cylinder is 1092727 inches; required the ſide of a cube that is equal in area thereto?

1092727(103 Anſ.	103
1	103
092727 Reſolvend	309
300	1030
30	10609
3030 Diviſor	103
900	31827
270	106090
27	1092727 Proof.
92727 Subtrahend.	

2. There is a ſtone of a cubic form, which contains 135796744 cubic inches; I demand the ſuperficial content of one of its ſides? Anſ. 264196 ins.

CASE

CASE IV.

To find two mean proportionals between two given numbers.

RULE.

Divide the greater extreme by the leſs, and the cube root of the quotient, multiplied by the leſs extreme, gives the leſs mean. Multiply the ſaid cube root by the leſs mean, and the product is the greater mean proportional.

EXAMPLES.

1. Find two mean proportionals between 7 and 189.

7)189 27(3×7=21 the leſſer mean.
27 3
27 63 the greater mean.

As 7 : 21 :: 63 : 189 Proof.

2. Find the two geometric means between 8 and 1728.
Anſ. 48 and 288.

3. Find the two geometric means between 5 and 1715.
Anſ. 35 and 245.

REMARK.

1ſt. The two laſt caſes relate to the uſe of the cube root. It has alſo many other uſes, which will occur to the learner in his going through a courſe of mathematical ſtudies.

2d, There are other roots, beſides the ſquare and cube root, that may be extracted; as the biquadrate, or fourth root; the ſurſolid, or fifth root; the ſquared cube, or ſixth root, &c. for extracting which ſeveral rules are given by different authors; but, as they are of no uſe in buſineſs, they are omitted here.

DUODECIMALS, or CROSS MULTIPLICATION.

DUODECIMALS or croſs multiplication, is a rule much uſed by workmen and artificers in caſting up the contents of their works.

It is called *duodecimals*, becauſe the parts decreaſe by twelves, from the place of feet towards the right hand. And, it is called *croſs multiplication*, becauſe the factors are ſometimes multiplied croſs ways.

RULE.

Under the multiplicand write the ſame names of the multiplier; that is, feet under feet, inches under inches, parts under parts, &c. Then, multiply every term in the multiplicand, beginning at the loweſt, by the feet in the multiplier, and write each product under its reſpective term, carrying one for every 12, from each lower denomination to its next higher. This done, multiply every term in the multiplicand by the inches in the multiplier, and ſet the product of each term one place removed towards the right hand. Proceed in like manner with the ſeconds, and all the reſt of the denominations, if there be any more; and the ſum of the lines will be the anſwer.

NOTE.

1ft. 12 inches or primes	make one	foot	ft. in. or	
12 parts or ſeconds		inch or prime	pt. or	″
12 thirds		part or ſecond		‴
12 fourths		third		⁗

2d. If the feet in the multiplicand are expreſſed by a large number; inſtead of multiplying by the inches, parts, &c. proceed as in the rules of practice, by taking ſuch aliquot parts as are equal to the inches, ſeconds, &c. of the multiplier.

3d. If the feet in both the multiplicand and multiplier are expreſſed by a large number; multiply the feet by

by the feet, and take parts for the inches, seconds, &c. of the multiplier out of the multiplicand; and parts for the like denominations of the multiplicand out of the feet of the multiplier only, and the sum of all the lines will be the answer.

PROOF.

Questions in this rule may be proved by decimals, by practice or by vulgar fractions.

EXAMPLES.

1. Multiply 10 feet 9 ins. 6 pts. by 8 ft. 7 ins. 9 pts.

By Practice.

ft.	ins.	pts.		ins.	pts.		ft.	ins.	pts.	
10	9	6		6	0	½	10	9	6	
8	7	9							8	
86	4	0	'''				86	4	0	
6	3	6	6 ''''	1	0	⅛	5	4	9	''
	8	1	1 6	0	6	⅛	0	10	9	6
				0	3	½	0	5	4	9 '''
93	3	7	7 6 Anſ.				0	2	8	4 6
							93	3	7	7 6 Proof

2. Multiply 4 feet 6 ins. by 14 feet 9 ins.
Anſ. 66 ft. 4 ins. 6 pts.

3. Multiply 11 ft. 8 ins. by 9 ft. 7 ins.
Anſ. 111 ft. 9 ins. 8 pts.

4. Multiply 4 ft. 7 ins. 8 pts. by 9 ft. 6 ins.
Anſ. 44 ft. 0 ins. 10 pts.

5. What is the product of 7 ft. 5 ins. 6 pts. and 3 ft. 8 ins. 9 pts? Anſ. 27 ft. 9 ins. 9 pts. 1 thd. 6 fths.

6. Multiply 39 ft. 10 ins. 7 pts. by 18 ft. 8 ins. 4 pts.
Anſ. 745 ft. 6 ins. 10 pts. 2 thds. 4 fths.

7. Multiply 34 feet 4 ins. 6 secs. by 29 feet 5 ins. 4 pts. Anſ. 1012 ft. 1 in. 10 pts.

8. Multiply 368 feet 7 ins. 5 pts. by 137 ft. 8 ins. 4 pts. Anſ. 50756 ft. 7 ins. 10 pts. 9 thds. 8 fths.

9. Multiply

9. Multiply 44 ft. 2 ins. 9 pts. 2 thds. 4 fths. by 2 ft. 10 ins. 3 pts.

Anſ. 126 ft. 2 ins. 10 pts. 8 thds. 10 fths. 11 fths.

10. Multiply 81 ft. 11 ins. 7 pts. by 57 ft. 8 ins. 5 pts.

Anſ. 4729 ft. 6 ins. 1 pt. 5 thds. 11 fths.

ARITHMETICAL PROGRESSION.

ARITHMETICAL progreſſion is when any ſeries or rank of numbers increaſe or decreaſe by a common difference; as, 3, 4, 5, 6, 7 increaſe by the common difference 1; and 12, 10, 8, 6, 4 decreaſe by the common difference 2.

The numbers which form the ſeries are called the *terms* of the progreſſion.

The *firſt* and *laſt* terms of a ſeries are called *extremes*, and the other terms the *means*.

NOTE.

There are five things in *Arithmetical progreſſion* which are to be particularly attended to; viz. 1ſt. The firſt term. 2d. the laſt term. 3d. the number of terms. 4th. the common difference. 5th. the ſum of all the terms. Any three of theſe being given, the other two may be readily found.

REMARK.

Arithmetical progreſſion may be divided into ten caſes, each containing two propoſitions; but as many of theſe are beſt underſtood and ſolved by *Algebraic proceſſes*, they will be omitted, and only ſome of the moſt uſeful of them inſerted here.

PROBLEM I.

The firſt term, the laſt term, and the number of terms being given, to find the ſum of all the terms.

RULE.

RULE.

Multiply the ſum of the extremes by the number of terms, and half the product will be the anſwer.

EXAMPLES.

1. The firſt term of an *Arithmetical progreſſion* is 4, the laſt term 40, and the number of terms 12; required the ſum of the ſeries?

40
4
44
12
2)528
264 Anſ.

2. How many ſtrokes do the clocks at Venice (which go on to 24 o'clock) ſtrike in the compaſs of a natural day? Anſ. 300.

3. What debt can be diſcharged in a year, by weekly payments, in *Arithmetical progreſſion*, whereof the firſt payment is 1s. and the laſt 5l. 3s.?—Anſ. 135l. 4s.

4. Suppoſe 100 ſtones were placed in a right line, a yard diſtant from one another, and the firſt ſtone to be a yard from a baſket; how many miles muſt that man travel who gathers them ſingly into the baſket?

Anſ. 5 ms. 5 fgs. 36 ps. 2 yds.

PROBLEM II.

The firſt term, the laſt term, and the number of terms being given, to find the common difference.

RULE.

Subtract 1 from the number of terms, and divide the difference of the extremes, by that remainder, and the quotient will be the common difference.

EXAMPLES.

1. If the extremes be 10 and 70, and the number of terms 21; what is the common difference, and the ſum of the ſeries?

21	70	70
1	10	10
20	2,0)60	80
	3 the com. diff.	21
		2)1680
		840 the ſum of the ſeries.

2. A man had 8 ſons, the youngſt was 4 years old, and the eldeſt 32, and their ages increaſe in *Arithmetical progreſſion*; what is the common difference of their ages? Anſ. 4 years.

3. A man is to travel from London to a certain place in 12 days, and to go but 3 miles the firſt day, increaſing every day by an equal exceſs, ſo that the laſt day's journey may be 58 miles; required the daily increaſe, and the diſtance of the place from London?

Anſ. daily increaſe 5 ms.—diſt. 366 ms.

4. Given the firſt term of a ſeries 0 and the laſt 34, and the number of terms 4, to find the common difference? Anſ. $11\frac{1}{3}$.

PROBLEM III.

The firſt term, the laſt term, and the common difference being given, to find the number of terms.

RULE.

Divide the difference of the extremes by the common difference, and add 1 to the quotient for the anſwer.

EX-

EXAMPLES.

1. The extremes are 3 and 19, and the common difference 2; what is the number of terms?

19
3
2)16
8 + 1 = 9 Anſ.

2. A debt is to be diſcharged by monthly payments in *Arithmetical progreſſion*, the firſt payment to be 1l., the laſt 23l., and the common difference 2l.; in what time will it be diſcharged, and how much is the debt?

Anſ. 12 mos., the ſum 144l.

3. A perſon travelling northward from London, went 8 miles the firſt day, and increaſed every day's journey 3 miles, till at laſt he went 50 miles in one day; how many days, and how far did he travel?

Anſ. 15 days, and travelled 435 ms.

4. A man being aſked how many children he had, anſwered, my youngeſt child is 5 years old, and my eldeſt 43, and I have increaſed one in my family every 2 years. How many children had he?

Anſ. 20 children.

PROBLEM IV.

One extreme, the common difference, and the number of terms being given, to find the other extreme.

RULE.

Subtract one from the number of terms, and multiply the common difference by the remainder. Then, add the product to, or ſubtract it from, the given term, according as it is leſs or greater, and the ſum or difference will be the anſwer.

EXAMPLES.

1. A person takes out of his pocket, at 10 different times, so many different numbers of crowns, every one exceeding the former by 2; the last was 23; what was the first?

10—1=9×2=18. Then 23—18=5 the Anſ.

2. A traveller performs a journey in 20 days, and makes every day's journey 4 miles greater than that preceding. His laſt day's journey was 59 miles; how far did he travel the firſt day? Anſ. 17 miles.

3. The leaſt term is 3, the common difference 2, and the number of terms 9; what is the greateſt term?

Anſ. 19.

4. A man ſold his coat after the rate of 1s. for the firſt button, 2s. for the ſecond, 3s. for the third, and ſo on to the whole number of buttons upon it, which was 12; what was the coat ſold for?—Anſ. 3l. 18s.

PROBLEM V.

One extreme, the number of terms, and the ſum of the ſeries being given, to find the other extreme.

RULE.

Multiply the ſum of the ſeries by 2, and divide the product by the number of terms; from this quotient ſubtract the given extreme, and the remainder will be the extreme ſought.

EXAMPLES.

1. A gentleman received 420l. at 12 ſeveral payments in *Arithmetical progreſſion*; the firſt payment was 3l. 8s. required the laſt payment?

£. £. £. £. s. £. s.
420×2=840÷12=70—3 8=66 12 Anſ.

2. The greateſt term is 45, the number of terms 13, and the ſum of the ſeries 325; what is the leaſt term?

Anſ. 5.

GEO-

GEOMETRICAL PROGRESSION.

Geometrical progreſſion is when any ſeries or rank of numbers increaſe or decreaſe by a common multiplier or diviſor, called the *ratio*; as, 2, 4, 8, 16, 32 increaſe by the common ratio 2; and 81, 27, 9, 3, 1 decreaſe by the common ratio 3.

NOTE.

1ſt. In *Geometrical progreſſion*, the ſame 5 things are to be obſerved as in *Arithmetical progreſſion*, *viz.* 1ſt. The firſt term. 2d. the laſt term. 3d. the number of terms. 4th. the ratio. 5th. the ſum of all the terms. Any three of which being known, the reſt may be found.

2d. The principal difference between *Arithmetical progreſſion*, and *Geometrical progreſſion* conſiſts in uſing addition, ſubtraction, multiplication, and diviſion in the former, and multiplication, diviſion, involution and evolution in the latter. The rules for both are nearly the ſame.

3d. The remark in *Arithmetical progreſſion* is equally applicable to this rule.

PROBLEM I.

The firſt term, the laſt term, and the ratio being given, to find the ſum of the ſeries.

RULE.

Multiply the laſt term by the ratio, and from the product ſubtract the firſt term, and the remainder divide by the ratio leſs 1 for the ſum of the ſeries.

EXAMPLES.

1. If the extremes be 5 and 885735, and the ratio 3; what is the ſum of the ſeries?

$885735\times3=2657205-5=2657200\div2(=3-1)=1328600$ Anſ.

2. The extremes of a *Geometrical ſeries* are 1024 and 59049, and the ratio is $1\frac{1}{2}$; what is the ſum of the ſeries? Anſ. 175099.

3. On new year's day a gentleman married, and received of his father-in-law a guinea, with a promiſe that he was to have a preſent, on the firſt day of every month, double the preceding one, for the firſt year; what would the lady's portion be?

Anſ. 4299l. 15s.

4. It is ſaid that Seſſa, who invented the game of cheſs, was bid by his prince to name his own reward. Seſſa aſked 1 grain of wheat for the firſt ſquare on the cheſs-board, 2 grains for the ſecond, 4 for the third, and ſo on, doubling the grains for each following ſquare, to the whole number on the board, which is 64. Now, allowing 7680 grains to a pint, how many buſhels of wheat will his reward amount to?

Anſ. 37529996894754 bls. 1 gn. 0 pts. 4095 qrs.

5. A laceman well verſed in numbers, agreed with a gentleman to ſell him 20 yards of rich gold brocaded lace, for 2 pins the firſt yard, 6 for the ſecond, 18 for the third, and ſo on in triple proportion. I demand how much the lace produced, ſuppoſing the pins worth a farthing per 100; alſo whether the laceman gained or loſt by the ſale thereof, the lace having coſt him 8l. 1s. 8d. per yard?

		£.	s.	d.
Anſ.	The lace produced	290565	7	4
	The laceman gained	290403	14	0

PROBLEM II.

One of the extremes, the ratio, and the number of terms being given, to find the other extreme.

RULE.

R U L E.

From the number of terms ſubtract 1, and involve the ratio to the power expreſſed by the remainder. Then, multiply or divide the given extreme by the ſaid power, according as it is the greateſt or leaſt, and the product or quotient will be the extreme ſought.

E X A M P L E S.

1. The greateſt term is 512, the ratio 2, and the number of terms 10; what is the leaſt term?

10—1=9, and $2\times2\times2\times2\times2\times2\times2\times2\times2=512\div512$
$=1$ the Anſ.

2 A boy agrees for 16 oranges, to pay only the price of the laſt, reckoning a farthing for the firſt, a half penny for the ſecond, &c. doubling the price to the laſt. How much did he pay for the whole bargain?

Anſ. 34l. 2s. 8d.

3. What debt will be diſcharged in a year, or 12 months, by paying 1l. the firſt month, 2l. the ſecond, 4l. the third, and ſo on; and what will the laſt payment be?

£.
Anſ. 4095 the debt.
2048 the laſt payment.

P R O B L E M III.

The firſt term, the laſt term, and the ſum of the ſeries being given, to find the ratio.

R U L E.

From the ſum of the ſeries ſubtract the firſt term, and divide the remainder by the difference between the ſaid ſum and the laſt term, and the quotient will be the ratio required.

EXAMPLES.

1. The extremes are 5 and 885735, and the ſum of the ſeries is 1328600; what is the ratio?

1328600—5=1328595, and 1328600—885735=442865. Then 1328595÷442865=3 the Anſ.

2. If the extremes of a ſeries be 1 and 729, and the ſum of the ſeries 1093; what is the ratio? Anſ. 3.

3. A man received 4095 guineas in one year, by monthly payments in *Geometrical progreſſion*, and his firſt receipt was 1 guinea, and his laſt 2040 guineas; in what ratio was the money received? Anſ. 2.

PROBLEM IV.

The firſt term and ratio of a decreaſing ſeries being given, to find the ſum of the ſeries.

RULE.

Divide the ſquare of the firſt term by the difference between the firſt and ſecond term of the ſeries, and the quotient will be the anſwer.

EXAMPLES.

1. Required the ſum of the infinite *Geometrical ſeries* 8, 4, 2, 1, $\frac{1}{2}$, &c.?

$8\times8=64\div4\ (=8-4)=16$ the Anſ.

2. Suppoſe a ball flies 12 miles the firſt hour, 10 the ſecond, and ſo on in the proportion of 12 to 10 to infinity; what ſpace would it move through?

Anſ. 72 miles.

3. What is the ſum of the infinite ſeries $\frac{1}{3}$, $\frac{1}{9}$, $\frac{1}{27}$, $\frac{1}{81}$, &c.? Anſ. $\frac{1}{2}$.

POSITION

POSITION, or the RULE of FALSE.

POSITION, suppoſition or the rule of falſe is a rule wherein falſe or ſuppoſed numbers are uſed, in order to diſcover true ones; and is applied to the performing of ſuch queſtions as cannot be reſolved by the common direct rules.

SINGLE POSITION.

SINGLE poſition teacheth how to perform thoſe queſtions that require but one ſuppoſition to diſcover the true reſult.

RULE.

Suppoſe any number, and perform the ſame operations with it as are deſcribed to be performed in the queſtion. Then ſtate,—as the reſult of the operation : is to the ſuppoſed number : : ſo is the reſult in the queſtion : to the number ſought.

NOTE.

The number 1 may be made a conſtant ſuppoſition in all queſtions; and, in moſt caſes, it is better than any other number.

PROOF.

Add the ſeveral parts of the ſum together, and if the ſum agrees with the given number, the operation is right.

EX.

EXAMPLES.

1. What number is that to which if we add the half, the fourth, and the fifth of itſelf the whole ſum will be 39?

Suppoſe the number to be 40
half of it is - - 20
one fourth of it is 10
one fifth of it is 8
78
Anſwer - - - - 20
half of it is - - 10
one fourth of it is 5
one fifth of it is 4
39 Proof.

As 78 : 40 : : 39
40
78)1560(20 Anſ.
156
...0

2. Find a number which being multiplied by 8, and the product divided by 5, the quotient will be 24.
Anſ. 15.

3. Two geeſe, 4 ducks, and 8 hens coſt together 14 ſhillings. A gooſe coſt twice the price of a duck, and 5 times that of a hen; what did each coſt?
Anſ. A gooſe coſt 2s. 6d. a duck 1s. 3d. a hen 6d.

4. A perſon bought a chaiſe, horſe, and harneſs for 60l. The horſe came to twice the price of the harneſs, and the chaiſe to twice the price of the horſe and harneſs. What did he give for each?—Anſ. 13l. 6s. 8d. for the horſe, 6l. 13s. 4d. for the harneſs, and 40l. for the chaiſe.

5. Required a number the ſquare whereof is equal to 4 times the number itſelf? Anſ. 4.

6. A man carrying a bag of money in his hand, was aſked how much was in it. He anſwered that the third, fourth, and fifth of it made 94l. How much money had he? Anſ. 120l.

7. What number is that which being increaſed by $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ of itſelf ſhall be 63? Anſ. 36.

8. A

8. A general being asked the number of m army consisted of, answered, that $\frac{1}{4}$ of $\frac{1}{2}$ amounte 900; what number of men had he? Ans. 2400 me

9. A man being asked his age, said, if $\frac{1}{7}$ of the yea I have lived be multiplied by 7, and $\frac{2}{3}$ of them be added to the product, the sum will be 292; what was his age? Ans. 60 years.

REMARK.

All the questions in *position* whose results are proportional with their suppositions, or with some power or root of their suppositions, may be resolved by the above rule. Such as are not in one of the abovenamed situations belong to double position.

DOUBLE POSITION.

DOUBLE position teacheth how to perform those questions that require two suppositions to find the number sought.

RULE.

Take any two convenient numbers, and proceed with each according to the conditions of the question. Then, find how much the results are different from the results in the question, and call these differences the *errors*. This done, multiply each of the errors by the contrary supposition, and find the sum or difference of the products; and then, if the errors are alike, divide the difference of the products by the difference of the errors for the answer; but if they are unlike, the quotient of the sum of the products divided by the sum of the errors will be the answer.

NOTE.

1st. The errors are said to be alike, when the results are both too great or both too little; but when one is too great and the other too little, they are said to be unlike.

2d. It

2d. It will be often advantageous to make 1 and 0 the suppositions.

EXAMPLES.

1. John's age is now double Thomas's; but 15 years ago it was three times Thomas's; what are their ages now?

	yrs.	yrs.
Suppose John's age to be 80, then Thomas's will be		40
From which subtract	15	15
Leaves	65	25
It should be	75 or 25×3	3
Error	10 too little	75
Suppose John's age to be 70, then Thomas's will be		35
	15	15
	55	20
	60	3
	5 too little	60

The first error 10×the second supposition 70=700
second 5× first 80=400

The difference is 5 5)300

John's age 60 Ans.

	yrs.	yrs.
John's age is 60, and Thomas's will be		30
	15	15
Proof.	45	15
	45	3
		45

2. A

2. A man left his 3 ſons his eſtate in money; to F half wanting 50l.; to G one-third; and to H reſt, which was 10l. leſs than the ſhare of G; I demand each man's part?—Anſ. F's ſhare was 130l. G's 120l. and H's 110l.

3. Double my money for me, ſaid John to Tom, and I will give thee 6d. out of the ſtock. With the remainder he applied in like manner to Dick, with equal ſucceſs, and gave him alſo 6d. He repeated this propoſal to Ned, and then 6d. was all he had to give. Pray what ſum had he to begin with? Anſ. $5\frac{1}{4}$d.

4. A labourer was hired for 40 days, upon this condition, that he ſhould receive 20d. for every day he wrought, and forfeit 10d. for every day he was idle. Now he received at laſt 2l. 1s. 8d.; how many days did he work, and how many was he idle?—Anſ. He wrought 30 days, and was idle 10 days.

5. A perſon gave 14l. 8s. for a hogſhead of wine, which was a mixture of wine at 4s. and at 5s. the gallon. Required the quantity of each ſort?—Anſ. 27 gs. at 4s. and 36 gs. at 5s.

6. There is a fiſh whoſe head is 9 inches long, and his tail is as long as his head and half as long as his body, and his body is as long as his tail and his head; what is the whole length of the fiſh? Anſ. 3 feet.

7. Old John, who had in credit liv'd,
Though now reduc'd, a ſum receiv'd;
This lucky hit's no ſooner found,
Than clam'rous duns came ſwarming round.
To th' landlord,—baker,—many more,
John paid in all, pounds ninety-four.
Half what remain'd—a friend he lent,
On Joan and ſelf, one fifth he ſpent;
And when of all theſe ſums bereft,
One-tenth o' th' ſum receiv'd had left.
Now ſhew your ſkill, ye learned youths,
And by your work the ſum produce.

Anſ. 141l.

8. A and B began to play together with equal ſums of money. A firſt won twenty guineas, but afterwards loſt back $\frac{2}{7}$ of what he then had; after which B had 4 times as much as A. What ſum did each begin with?

Anſ. 100 guineas.

REMARK.

Though this rule does not always produce the number ſought, or anſwer all ſorts of queſtions exactly; yet, by aſſuming new numbers, nearer to the leſs error, and repeating the operation, an anſwer ſufficiently accurate will be found.

PERMUTATION or VARIATION of QUANTITIES.

PERMUTATION or variation of quantities is the ſhewing how many different ways any given number of things may be changed, regard being had to the order they ſtand in, for no two parcels are to have all their quantities placed in the ſame ſituation.

PROBLEM I.

To find the variations that can be made of any given number of things, all different from each other.

RULE.

Multiply together as many of the numbers 1, 2, 3, &c. as there are things to be varied, and the laſt product will be the anſwer.

EXAMPLES.

1. How many changes may be rung on 8 bells?

$1\times2\times3\times4\times5\times6\times7\times8=40320$ Anſ.

2. How may different ways may the firſt 5 notes in muſic be varied? Anſ. 120.

3. An

3. An accountant told a gentleman, who had ſtantly 8 perſons at his table, that he would gladly m. a ninth, and was willing to give 20 guineas for h board, ſo long as he could place the ſaid company at dinner, differently from any one day before; this being accepted, what did his entertainment coſt him per ann.?

Anſ. 5d. +.

PROBLEM II.

To find the variations that can be made of any given number of things, by changing 2, 3, 4, &c. at a time.

RULE.

Multiply the whole number of things given by the ſame number leſs 1, then by ditto leſs 2, &c. decreaſing by one to the number of quantities to be taken at a time, and the laſt product will be the anſwer.

EXAMPLES.

1. How many different numbers may be formed out of the nine digits and cipher, each number conſiſting of 6 figures? $10\times9\times8\times7\times6\times5=151200$ the Anſ.

2. How many words can be made with 5 letters of the alphabet, admitting that a number of conſonants may make a word? Anſ. 5100480.

PROBLEM III.

To find the variations that can be made of any given number of things, ſome being of one ſort and ſome of another.

RULE.

Multiply continually $1\times2\times3$, &c. up to the number of things given for a dividend; and multiply continually $1\times2\times3$, &c. up to the number of things given of the firſt ſort, alſo up to the number of things given of the ſecond or third, &c. ſorts, and take the

joint product of the products for a divisor. Then divide, and the quotient will be all the changes.

EXAMPLES.

1. How many variations may there be of ppqqqrrrr?
$1\times2\times3\times4\times5\times6\times7\times8\times9=362880$ the dividend.
$1\times2=2\times1\times2\times3=12\times1\times2\times3\times4=288$ the divisor.
Then $362880\div288=1260$ the answer.

2. How many variations may be made of the letters in the word *bacchanalia?* Ans. 831600.

REMARK.

It would be easy to continue the *variation of quantities* to a much greater extent; and also to enlarge upon the *combination* and *composition of quantities*; but these rules may be expressed and wrought much better by *Algebra* than *common numbers*, and therefore they are omitted here.

MISCELLANEOUS QUESTIONS.

1. Write down four hundred millions, twelve thousand and eighty. Ans. 400012080.

2. Suppose a child was born in the year 1777; in what year will he be 46 years of age? Ans. 1823.

3. I demand the sum of 1748 added to itself? Ans. 3496.

4. What number is that which being multiplied by 16, the product will be 784? Ans. 49.

5. My purse and money, quoth Dick, are worth 12s. 7d., but the money is worth 7 times as much as the purse; pray what is the sum therein? Ans. 11s. $0\frac{1}{2}$d.

6. What is the length of the day when the sun rises 30 minutes past five? Ans. 13 hs.

7. If a gentleman's income be 282l. 2s. per annum; what is it per week? Ans. 5l. 8s. 6d.

8. If

8. If $\frac{1}{3}$ of 6 be 3; what will $\frac{1}{4}$ of 20 be? Anſ. $7\frac{1}{2}$

9. How long will a perſon be in ſaving 500l. if he lays up a guinea, a half-guinea, a five and three pence, a crown, a half-crown, a ſhilling and a ſixpence every week? Anſ. 4 ys. $10\frac{1}{2}\frac{3}{4}\frac{3}{9}$ wks.

10. What part of 3d. is $\frac{1}{3}$ part of 2d.? Anſ. $\frac{1}{9}$.

11. If one pound ten, and 40 groats
Will buy a load of hay;
How many pounds, with nineteen crowns,
For twenty loads will pay?
Anſ. 38l. 11s. 8d.

12. What is the vulgar fraction equivalent to the circulating decimal ·432432? Anſ. $\frac{48}{111}$.

13. What number is that of which 9 is $\frac{3}{7}$ of it?
Anſ. $13\frac{1}{3}$.

14. John, James and Edward join ſtocks in trade, the amount of which was 100l. John gained 3l. James 5l. and Edward 8l.; what was each man's ſtock?
Anſ. John's 18l. 15s. James's 31l. 5s. and Edward's 50l.

15. What muſt be paid for three ſixteenths of a ſhip that is valued at 1400l.? Anſ. 262l. 10s.

16. What is the difference between twice the ſquare of 12, and the ſquare of twice twelve? Anſ. 288.

17. If to my age there added be,
One half, one-third, and three times three,
Six ſcore and ten the ſum will be;
What is my age, pray ſhew it me?
Anſ. 66.

18. Sold goods for 700l. to be paid at two 4 months, that is, $\frac{1}{2}$ at 4 months, and $\frac{1}{2}$ at 8 months; what is their preſent worth, diſcounting at 5 per cent. ſimple intereſt?
Anſ. 682l. 19s $5\frac{1}{2}$d.

19. In an orchard of fruit trees, $\frac{1}{3}$ of them bear apples, $\frac{1}{4}$ pears, $\frac{1}{5}$ plumbs, and 50 of them cherries; how many trees are there in all? Anſ. 600.

20. A gentleman a chaiſe did buy,
A horſe and harneſs too;
They coſt the ſum of three ſcore pounds,
Upon my word 'tis true;
The harneſs came to half of th' horſe,
The horſe twice of the chaiſe;
And if you find the price of them,
Take them and go your ways.

Anſ. The chaiſe coſt 15l. the horſe 30l. the harneſs 15l.

21. A commiſſioner of a certain turnpike road, was deſirous of knowing how many coaches, chaiſes, and ſingle horſes went through a turnpike, near his houſe, on a particular day. The man was ordered to keep account; but being an arithmetician, and ſomewhat arch, would give no other than this: That on account of them he had received 2l. 3s.; that as often as 15 horſes paſſed, 4 chaiſes and 2 coaches paſſed; and that every coach paid 6d., chaiſe 4d. and horſe 1d. Do pray help the commiſſioner out, for he is moſt ſadly puzzled. Anſ. 180 horſes, 48 chaiſes, 24 coaches.

22. Suppoſe I hear the report of a gun 8 ſeconds after I ſee the flaſh, how far is the gun from me, ſuppoſing the ſound to move 1142 feet in a ſecond of time?

Anſ. 1 mile, $1285\frac{1}{3}$ yds.

23. If a tower be 384 feet high from the foundation, and $\frac{1}{8}$ part be under the earth, and $\frac{1}{8}$ part under the water; how much in height is viſible?

Anſ. 272 feet.

24. Required the vulgar fraction equal to the mixed circulate .3728484? Anſ. $\frac{15138}{41515}$.

25. What part of 25 is $\frac{5}{8}$ of an unit? Anſ. $\frac{1}{40}$.

26. Goods weighed on a falſe balance will weigh more on one end than the other. To find the true weight whereof, multiply the two weights together, and extract the ſquare root of the product. If any article then weighs 10 ozs. on one end of a falſe balance, and 14 ozs. 8dwts. on the other; what is its real weight? Anſ. 1 lb.

27. A caſtle wall there was, whoſe height was found,
To be a hundred feet from th' top to th' ground;
Againſt the wall a ladder ſtood upright,
Of the ſame length the caſtle was in height.
A waggiſh fellow did the ladder ſlide,
(The bottom of it) ten feet from the ſide.
Now I would know, how far the top did fall,
By pulling out the ladder from the wall?
Anſ. 6—ins.

28. Four figures of nine may be ſo placed as to denote 100, neither more nor leſs; pray how is that to be done? Anſ. $99\frac{9}{9}$.

29. If we add 1 to any year of our Lord. and divide the ſum by 19, the quotient will ſhew how many cycles of the moon have paſſed ſince it firſt took place, and the remainder will be the golden number for that year. What is the golden number for the year 1791?
Anſ. 6.

30. A guardian paid his ward 3500l. for 2500l., which he had in his hand 8 years; what rate of intereſt did he allow him? Anſ. 5 per cent.

31. To how much amounts the order, for which my factor, at the rate of $2\frac{1}{2}$ per cent. receives 22l. 10s.?
Anſ. 900l.

32. The weight of air upon a ſquare inch, on the ſurface of the earth, is about $14\frac{1}{2}$ lbs. avoirdupoiſe, at a medium. What then is the mean weight of the air preſſing upon a man's body, which meaſures generally about 15 ſquare feet?
Anſ. 13 tons 9 cwts. 5 ſts. 2 lbs.

33. Bought goods at 6d. per lb., and ſold them at $6\frac{1}{2}$d. per lb.; what was my gain per cent.?
Anſ. 8l. 6s. 8d.

34. A gang of 13 rogues having heard of an old miſer, reſolved to break into his garret; which they did, and took away 179 guineas, 63 half-guineas, and 40 quarter-guineas; what was each man's booty?
Anſ. 17l. 16s. $2\frac{1}{4}\ \frac{3}{13}$d.

35. A man buys 20 tons of cheese, which cost him 400l.; the freight and custom came to 50l., and other expences to 16l. 13s. 4d.; how must he sell it per pound to gain 20 per cent. by it? Anſ. 3d.

36. How many eggs, at 7 for 2d. will buy an eſtate of 100l. per annum, at 25 years purchaſe?
Anſ. 2100000.

37. If a cardinal can pray a ſoul out of purgatory, by himſelf, in an hour, a biſhop in three, a prieſt in five, and a friar in 7; in what time can they pray out 3 ſouls, all praying together?
Anſ. 1 hr. 47 ms. $23\frac{3}{71}$ ſecs.

38. If by ſelling goods at 2s. 3d. per lb. I clear cent. per cent.; what do I clear per cent. by ſelling them for 9 guineas per cwt.? Anſ. 50 per cent.

39. Part 1500l. give B 72l. more than A, and C 112l. more than B.
Anſ. A's ſhare is $414\frac{2}{3}$l. B's $486\frac{2}{3}$l. and C's $598\frac{2}{3}$l.

40. There are two numbers, the one 25, the other the ſquare of 25; what is the ſquare root of the ſum of their ſquares? Anſ. 625·4998+.

41. Sold 150 ſtones of wool at 10s. 6d. per ſtone, whereby I gained 8 per cent.; what did it coſt me per ſtone? Anſ. 9s. $8\frac{3}{4}$d.

42. Bought goods at 1l. 5s. per cwt.; how muſt I ſell them immediately, at 6 months credit, to allow myſelf 20 per cent. per annum profit?
Anſ. 1l. 7s. 6d. per cwt.

43. A gentleman finding ſeveral beggars at his door, gave to each 4 pence, and had 16 pence left; but if he had given to each 6 pence, he would have wanted 12 pence. How many beggars were there? Anſ. 14.

44. A young man received 210l. which was $\frac{1}{7}$ of his elder brother's portion, and 3 times the elder brother's portion was $\frac{1}{5}$ of the father's eſtate; what was the value of the eſtate? Anſ. 1890l.

45. B and C together can build a boat in 18 days; with the aſſiſtance of A they can do it in 11 days; in what time would A do it by himſelf?—Anſ. $28\frac{4}{7}$ days.

46 A